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A MANUAL

OF

OBSTETRICS.

BY

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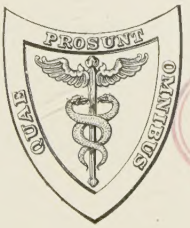
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SEVENTH EDITION,

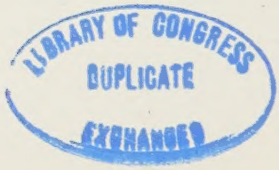
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DESIGNED IN PARTICULAR FOR

MY OWN STUDENTS,

IN THE

MEDICAL CLASSES OF THE COLUMBIAN UNIVERSITY,
WASHINGTON, D. C.,

AND THE

UNIVERSITY OF VERMONT,

TO THEM

This Book

IS AFFECTIONATELY DEDICATED,

WITH THE

EARNEST HOPE THAT IT MAY BE OF SERVICE TO THEM,
AND WITH THE BEST WISHES OF

THE AUTHOR.

PREFACE TO THE SEVENTH EDITION.

The exhaustion of the sixth edition of this work within two years affords the author a more than ordinary gratification, which was also unexpected, inasmuch as numerous other "Manuals" of obstetrics, the acknowledged merits of which render them most worthy aspirants for public commendation, have been issued from the medical press during the last few years.

It is hoped the seventh edition will maintain the standing of its predecessors and continue to receive the kindly approval of students and practitioners, for whose generous encouragement in the past the author begs to return his sincere thanks.

In the present revision, some errors and omissions have been rectified; a few additions introduced; the chapter on "Puerperal Septicæmia" has been re-written; and throughout the work an effort has been made to accentuate the importance of antiseptic midwifery with more emphasis than formerly.

As in the preparation of preceding editions, I am indebted for valuable information to the works of Parvin, Hirst, Galabin, the *American Text-book of Obstetrics*, and others, besides those already mentioned in the Preface to the First Edition. My thanks are also due to the gentlemen in charge

of the Library of the Surgeon-General's Office, U. S. A., for their kindly assistance.

Nor must I omit to tender to the distinguished publishers my hearty thanks for numerous personal courtesies, and for the care they have taken to produce the work clad in the best costume of the printer's art, to which, and to the influential good name of their ancient house, may doubtless be ascribed, in part, the gracious reception given to past editions.

With no pretensions to be a systematic treatise, but rather an elementary alphabet of obstetrics, this seventh revision is now left adrift to make its own way in the "struggle for existence" according to its deserts.

A. F. A. K.

1315 Massachusetts Av., N. W., Washington, D. C.,
January, 1898.

PREFACE TO THE FIRST EDITION.

The chief purpose of this book is to present, in an easily intelligible form, such an outline of the rudiments and essentials of Obstetric Science as may constitute a good groundwork for the student at the beginning of his obstetric studies, and one by which it is hoped he will be the better prepared to understand and assimilate the extensive knowledge and classical descriptions contained in larger and more elaborate text-books. Confessedly, in great part, a compilation from these, it is upon the more recent treatises of Leishman, Playfair, and Lusk that I have most largely depended, as authorities, in dealing with matters that are still unsettled, and it is with pleasure I acknowledge my indebtedness to these authors.

Whatever value the book may possess as a book of reference for the practitioner, I cannot but hope it may prove of service to those whose onerous duties allow but little leisure for consulting larger works, and who simply desire to refresh their minds upon the more essential points of obstetric practice.

It will be observed I have attempted to anglicize the terms "*ante-partum*" and "*post-partum*" into, respectively, "*ante-partal*" and "*post-partal*." If this be considered an error,

or an unwarrantable assumption, I can only plead guilty, and await sentence from my *confrères*.

For many of the illustrations—the plates of which were placed at my disposal by the publishers—I am indebted to the works of Meigs, Leishman, and Playfair; for others, which will be found only in this work, my grateful acknowledgments are cordially extended to my friend and former pupil, Dr. William Nicholson, of this city.

A. F. A. K.

MAY, 1882.

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OBSTETRICS.

CHAPTER I.

INTRODUCTION.—THE PELVIS.

Obstetrics is the science and art of midwifery. Its object is "the management of woman and her offspring during pregnancy, labor, and the puerperal state." In its wider scope it embraces a knowledge of the structure and functions of the reproductive organs and of their relations to the general system.

The Pelvis.—The word "pelvis" means basin. It is a strong framework of bones, in which the reproductive organs are contained, and to which they are attached, and its cavity contributes to form a canal through which the child must pass during parturition.

It is composed of the right and left innominate bones sacrum, and coccyx.

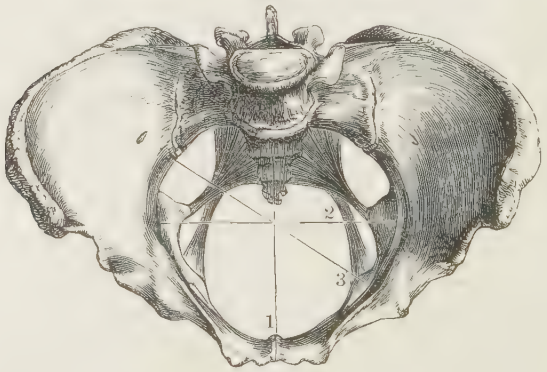
The Sacrum and Coccyx.—The following anatomical features of the sacrum are of obstetrical importance:

First, its *promontory*—the central, projecting, anterior border of the superior surface (or base) of the bone. From this promontory the antero-posterior diameter of the *brim* of the pelvic *basin* is measured, and a material reduction in its distance from the symphysis pubis, directly opposite, constitutes the *most common* variety of pelvic deformity. The *smooth convexity* of the anterior border of the promontory is important, for it causes the globular head of the child to glide off, during labor, to one or other side of the median line, where there is more room for it to pass, as will be explained hereafter.

Second. The *anterior concave surface* or "*hollow*" of the sacrum. It contributes to give amplitude and curvature to the pelvic canal. It is in conformity with this curvature of the sacrum that the long obstetrical forceps is made with what is called its "sacral curve." Material increase or decrease in the degree of sacral curvature constitutes deformity, and may render labor mechanically difficult or impossible. Rarely bony tumors (exostoses) spring from the anterior surface of the sacrum and obstruct delivery. This surface of the bone is pierced by the anterior sacral foramina, which give exit to the anterior sacral nerves.

Third. Each *lateral surface* of the sacrum presents a rough, ear-shaped area—the *auricular, articular surface*—covered with cartilage, which joins a similar shaped surface on the iliac bone, constituting the *sacro-iliac synchondrosis.* The posterior ends of the *oblique diameters* of the pelvic brim terminate at the sacro-iliac synchrondroses. That portion of the bone extending from the sacro-iliac synchondrosis to the side of the body of the first sacral vertebra is called the *wing* (*ala*) of the sacrum; one on each side, of course. (See Fig. 1.)

FIG. 1.



1. Antero-posterior (conjugate). 2. Bis-iliac (transverse). 3. Oblique.

Fourth. The apex, or inferior extremity of the sacrum, presents a transversely oval facet, covered with cartilage, for articulation with a corresponding oval surface upon the coccyx. The sacro-coccygeal articulation is an amphiarthrosis or mixed

joint, furnished with a synovial membrane, and is movable; that is, the child's head during its passage out of the pelvis forces the coccyx backward, so as to leave more room between its tip and the symphysis pubis. In women past the prime of life this joint becomes anchylosed, the coccyx refuses to yield before the advancing head, and hence difficult labor.

Fifth. It is of the utmost importance to remember that the vertical measurement of the sacrum and coccyx, in the median line—*i. e.*, from the centre of the sacral promontory above to the tip of the coccyx below—the line of measurement being a chord of the sacro-coccygeal curve—is four inches and a half in length (4½) or 11.4 cm.; exactly *three times as long as the vertical depth of the symphysis pubis*, which is one inch and a half (1½) or 3.8 cm.

The Coccyx.—The coccyx is triangular in shape. It is composed of four rudimentary (caudal) vertebræ, which diminish in size from above downward. Its base is attached to the lower extremity of the sacrum, as already explained.

The Innominate Bone.—The internal aspect of the bone only requires study. There we find a prominent line or ridge beginning at the sacro-iliac synchondrosis, a little below the level of the sacral promontory, and extending obliquely forward, slightly downward, and at the same time describing a somewhat semicircular curve inward toward the median line, where it eventually joins its fellow of the opposite side at the symphysis pubis; this line is the *linea ilio-pectinea* of anatomists. It forms, with the sacral promontory, and two short ridges crossing the wings of the sacrum between the promontory and sacro-iliac synchondroses, a sort of cordiform outline, which is, in fact, the brim of the pelvic basin, or, technically, the *superior strait of the pelvis*. To recapitulate—the entire contour of the superior strait may be thus described: Beginning in the median line at the centre of the sacral promontory, it passes outward across one lateral half of the promontory until reaching the wing of the sacrum, then across the wing outward, forward, and slightly downward, until reaching the sacro-iliac synchondrosis, then it traverses the ilium and pubis, as just described, along the linea ilio-pectinea, until arriving at the spine of the pubis, and from thence to the symphysis pubis, and so on back, over the opposite side, until again

reaching the centre of the sacral promontory from whence it started. (See Fig. 1, page 26.)

The "false" pelvis, so-called, is all that portion of the pelvis situated *above* the superior strait, and is made up chiefly by the wings, crests, and spinous processes of the iliac bones. Its bony wall is deficient in front; hence it is, of course, an imperfect or "false" basin.

The "true" pelvis is all that portion of the basin situated *below* the brim. Its cavity is a little wider in every direction than the brim itself, while the false pelvis is a great deal wider; the brim is, therefore, a somewhat narrowed bony ring or aperture between these two; hence the term "strait" is given it.

In the cavity of the pelvis we find, on each side, the prominent *spine* (spinous process) *of the ischium* and the *inclined planes* of the ischium. The ischial spinous process projects from the posterior border of the body of the bone, about midway between the highest border of the great sciatic notch above and the lowest margin of the tuberosity of the ischium below. Its tip points at once downward, backward, and inward toward the median line, and extending from it forward and upward toward the upper margin of the acetabulum is an indistinct ridge of bone. Now the smooth, slanting internal surface of the ischium in front of and below this indistinct ridge is called the anterior *inclined plane of the ischium*, or the anterior inclined plane *of the pelvis*—no matter which. Note, however, its direction: it slants downward, *forward*, and inward toward the median line; so that a rounded body like the fœtal head, coming down from above and impinging upon it, would glide at once *lower down, move forward*, and also *inward toward* the pubic symphysis. Hence it is instrumental in producing what is called "*anterior rotation*" of the occiput in the mechanism of labor.

Of course, there is an "inclined plane" of this sort on both sides of the pelvis, called respectively the *right* and *left* anterior inclined planes.

The posterior inclined planes of the pelvis are rather difficult to define, but we may map them out as follows: Draw a line on the inner surface of the pelvic cavity from the *spinous process* of the ischium to the *ilio pectineal eminence* (in most pelves an indistinct ridge may be observed along this line). This line divides the anterior from the posterior inclined plane.

But as there is only a small remaining surface of the ischium *behind* the dividing line to form the *posterior* plane, it is evident that, in the living woman, this plane is completed by the sacro-sciatic ligaments and the muscular structures, etc., that fill up and cover the sacro-sciatic foramina. In a dried pelvis, therefore, especially when divested of its sacro-sciatic ligaments, it is possible to see only a very small part of the posterior inclined plane, viz., that part where it begins on the back of the dividing line just mentioned. Its continuance or extension downward and backward to the median line of the hollow of the sacrum can only be seen when the muscles and ligaments are intact; and of which, in fact, the larger portion of the posterior inclined plane is made up.

The posterior inclined plane causes the presenting part of the child impinging upon it to rotate downward, *backward*, and inward toward the median line of the sacrum. Of course, there is a posterior inclined plane on each side—right and left.

Complete ossification of the pelvic bones does not take place till about twenty years of age, which affords a probable explanation why a first labor is generally more easy during the early part of adult life than later. The bones yield a little, and, after labor is over, the pelvis probably retains to some extent the size and shape acquired by the first early delivery, so as to render subsequent labors more easy.

After *thirty* years of age the *sacro-coccygeal joint* may become firmly anchylosed and ossified so as to prevent yielding of the coccyx before the pressure of the child's head, thus adding another obstacle to delivery.

The Sacro-sciatic Ligaments.—The greater sacro-sciatic ligament (sometimes called the "posterior" one) arises from the posterior inferior spinous process of the ilium, the lower part of the lateral margin of the sacrum, and from the coccyx: it is inserted into the *tuberosity* of the ischium. The *lesser* (or "anterior") sacro-sciatic ligament arises from the lateral margin of the sacrum and coccyx, and is inserted into the *spinous process* of the ischium.

These ligaments convert the great sciatic notch into the great sciatic foramen, and the lesser sciatic notch into the lesser sciatic foramen.

The Great Sacro-sciatic Foramen transmits the pyriformis muscle, the gluteal vessels and nerve, the ischiatic vessels and nerves, the internal pudic vessels and nerve, and the nerve to the obturator internus muscle.

The Lesser Sacro-sciatic Foramen transmits the tendon of the obturator internus muscle, its nerve, and the internal pudic vessels and nerve.

The Obturator or Thyroid Foramen is situated in the antero-lateral part of the pelvic wall, between the pubis and ischium, sometimes called the "foramen ovale." It is bridged over by a strong membranous web of ligamentous tissue, called the *obturator membrane*, from the inner and outer surfaces of which arise, respectively, the internal and external obturator muscles. The obturator vessels and nerve pass through an aperture in the upper margin of the obturator membrane.

The Pubic Arch is formed by the two descending rami of the pubes, and (in the female) its inner smooth surface, lined at its central upper part by the subpubic ligament, is of such a size and shape as to be absolutely in unison with and adapted to admit the passage of the sides and base of the occipital pole of the fœtal head, as we shall see in describing the mechanism of labor in vertex presentations.

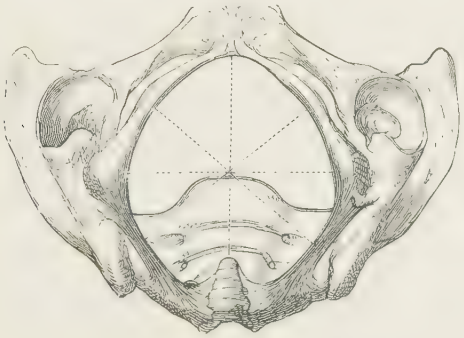
The Inferior Strait or "Outlet" of the Pelvis.—The dried bony pelvis, divested of its muscular appendages, is a basin without a bottom. The opening where the bottom ought to be is the inferior strait or outlet. Its contour may be described, in particular, as follows: Beginning at the summit of the pubic arch, in the median line of the body, it passes downward and backward along the inner margin of the descending ramus of the pubes and the ramus of the ischium until reaching the tuberosity of the ischium, then along the great sacro-sciatic ligament to the side of the sacrum and coccyx, and tip of the latter bone; then back along the opposite side of the pelvis to the point of starting at the pubic arch. (See Fig. 2, page 31.)

Articulations of the Pelvis:

First. The hinge-joint of the base of the coccyx with the apex of the sacrum (the *sacro coccygeal articulation*).

Second. The junction of the auricular-shaped articular surface of the side of the sacrum, with a similar shaped surface upon the adjacent ilium, the articular surface on both bones covered by a plate of cartilage. This is the *sacro iliac synchondrosis.*

FIG. 2.



Inferior strait, or outlet of pelvis.

Third. The *symphysis pubis*, formed by the apposition of the two bodies of the pubic bones in the median line. The articular surfaces are roughened by a series of nipple-shaped projections which dip into the layers of cartilage that cover them. These plates of cartilage are thicker in front than behind: they also diverge from each other posteriorly, especially at the upper part of the articulation, leaving a little space which is occupied by a synovial membrane, while lower down the interarticular space is filled with fibrous elastic tissue. The joint is further strengthened by several layers of the anterior pubic ligament in front; the posterior pubic ligament behind; the superior pubic ligament above; and below by a thick, triangular arch of ligamentous tissue (the subpubic ligament), which forms the upper boundary of the pubic arch. The joint is rendered still more secure by the dense membrane of the deep perineal fascia (triangular ligament), the apex of which is attached above to the symphysis pubis and subpubic ligament, and extends laterally to the rami of the ischia and pubes, thus bracing the sides of the arch together as the sides of the gable-end of a house are braced together by cross timbers.

Fourth. The *lumbo-sacral articulation*, where the inferior aspect of the body of the last lumbar vertebra (covered with cartilage) rests upon the superior surface of the base of the sacrum, which is also covered by a cartilaginous plate. These two layers of intervertebral cartilage are much thicker in front than behind, which, of course, tilts the sacrum backward, and contributes to form the promontory.

Fifth. The *hip-joint*, but with regard to this we need only remember the *position* of the acetabulum in relation to the pelvic brim; it is situated near the antero-lateral part of the brim's circumference—in fact, nearly obliquely opposite the sacro-iliac synchondrosis of the other side, which is, of course, placed in the *postero-lateral* part of the pelvic circumference.

Planes of the Pelvis.—The *inclined* planes of the ischium, sometimes called *inclined* planes of the *pelvis*, already studied, have nothing whatever to do with the planes of the brim, outlet, and pelvic cavity, now to be considered. Let it be distinctly understood that the "planes" and "*inclined*" planes are different things.

If we fill an ordinary basin with water, and float upon the surface a disk of paper whose circumference shall accurately fit the rim of the basin, the surface of the paper disk would represent the *plane of the brim* of that particular basin; in like manner, a disk of paper placed in the superior strait of the pelvis so that its circumference accurately fits the contour of the pelvic brim, would represent on its surface the "*plane of the superior strait*," or brim, of the pelvic basin. A disk of paper, similarly placed, in the outlet or inferior strait, would represent on its surface the "*plane of the inferior strait*," or outlet, of the pelvis. The surfaces of other disks placed at intermediate depths between the superior and inferior straits (such as might be imitated in the earthen basin by its different degrees of fulness) would constitute *planes of the pelvic cavity*, which latter might, of course, be multiplied in number indefinitely.

The *axis* of the plane of the superior strait is an imaginary line passing *through* the *centre* of the plane, at *right angles to its surface*, just as an axle-tree passes at right angles through the centre of a cart-wheel.

Owing to the anterior inclination of the pelvis when the woman stands erect, the brim is, as it were, tilted up behind,

so that the plane rests at an angle of about 60° with the horizon. Hence, therefore, its axis, instead of being vertical, is so disposed as nearly to agree with a line drawn from the umbilicus to the coccyx.

The plane of the outlet is more nearly horizontal than that of the superior strait, but it is still elevated posteriorly, so that a line drawn from the tip of the coccyx to the highest point of the pubic arch will meet the horizon at an angle of about 11°, which, however, is subject to variation, inasmuch as the pressing *back* of the coccyx during labor also presses its tip *downward* to some extent, which, of course, renders the angle more acute. The *axis* of the plane of the inferior strait nearly agrees with a line drawn from the sacral promontory to the anterior verge of the anus.

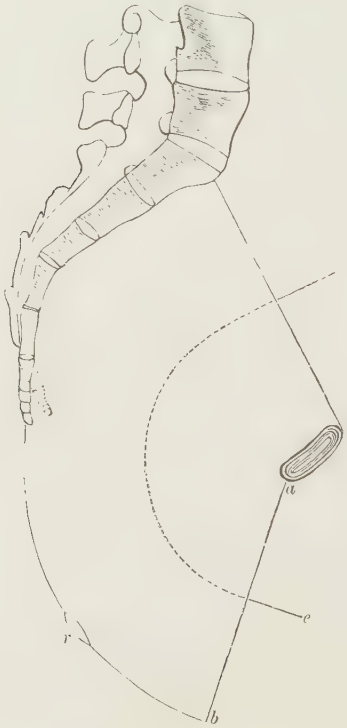
The axes of the planes of the pelvic cavity are lines drawn through the centres of the planes at right angles to their surface. The axes of a great number of such planes, placed end to end, would form an imperfectly circular curve, or at least a polyhedral arc of a curve, which would represent the real *axis of the pelvic canal.* Carus attempted to describe this curve (hence known as "Carus's curve") by placing one leg of a pair of compasses on the middle of the posterior edge of the symphysis pubis (in a bisected pelvis), the other leg of the compass having its point placed midway between the pubis and sacrum, and being moved so as to describe a curve from the superior to the inferior strait. But the true axis of the pelvic canal is not so geometrically perfect an arc of a circle as to admit of being drawn in this manner; it is more nearly the curve of an irregular parabola. (See Fig. 3, page 34.)

The pelvic canal in the living female does not really terminate at the inferior strait. In so far as its osseous walls are concerned it does, but the muscles and soft parts below form a continuation of the canal, and when these are stretched during parturition the posterior wall of the lower muscular part of the canal, viz., from the coccyx to the mouth of the vagina, measures quite as much as does the upper bony part, viz., from the coccyx to the sacral promontory. The *anterior* wall of the muscular part of the passage, corresponding with the pubis of the bony part, is, of course, deficient, and necessarily so, or the child could never be extruded in delivery. (See Fig. 3, page 34.)

The female pelvis differs from that of the male exactly in

those particulars which render it better adapted to facilitate parturition, notably (first) in being altogether *wider* in every direction, which gives *more room* for the child to pass; and (second) in being altogether *shallower*, which *lessens the distance* through which the child has to be propelled; and (third) the bones are thinner and smoother.

FIG 3.



Axis of the pelvic canal.

In the female pelvis the pubic arch is broader and rounder, the hollow of the sacrum is less curved (especially as regards its three upper segments, which are almost straight), the obturator foramen is larger, and a little farther, laterally,

from the symphysis pubis; the sacral promontory, ischial spinous processes, and tip of the coccyx are less prominent (so that they encroach to a less degree upon the cavity of the pelvic canal), and the sacro-sciatic notches are more spacious than in the male.

Changes taking place in the Female Pelvis toward the End of Pregnancy.—The inter-articular cartilages become *thicker;* the ligaments *softer and somewhat relaxed;* synovial fluid is formed more plentifully in the articulations; and the joints become, *to an exceedingly limited extent, movable,* so as to be capable of yielding a very little, if necessary, to permit the passage of the child. The swollen cartilages also act as cushions between the bones, thus lessening the mechanical shock of falls, jars, etc., somewhat like the "buffers" of railway cars.

Proof that the Joints actually Yield during Labor is inferred not only from the fact of its occurrence in the lower animals (in the guinea-pig the symphysis pubis separates an inch, so that the sacro-iliac synchondrosis plays the part of a hinge-joint; and in the cow the sacrum sinks down between the innominate bones, so as to push them wider apart), but also from the circumstances that in women dying during labor separation of the bones has been found on dissection; and in certain cases where the physiological loosening of the articulations has been pathologically exaggerated, locomotion has been interfered with, and the pubic symphysis found separated an inch or more. Again, if the pulp of the index finger be placed upon the lower end of the symphysis, at the summit of the pubic arch, and kept there while the woman walks, or stands first on one foot, then on the other, the bones on each side of the symphysis will be felt to glide up and down with each step, the side corresponding to the advancing limb being lower than the other. This is more marked in multiparæ: may be unappreciable in primiparæ. It can be observed toward the end of pregnancy.

Measurements of the Pelvis.—The object of measuring the pelvis is to compare the length of its diameters with the diameters of the child that passes through it; with-

out this it would be impossible to understand the mechanism of labor or to render suitable assistance in cases of difficult delivery.

The size of the pelvis is not the same in all women. It differs in different races of mankind and in different individuals of the same race. There is no reason why the pelves of any two women should be more exactly alike than the length of their feet or the features of their faces.

There are no means by which we can measure with precision (say within one-fifth or even one-fourth of an inch) the diameters of the pelvis in a living female; our measurements under such circumstances can only *approximate* the truth. Neither are there any means by which we can measure any more accurately the diameter of a child's head before it is born; we can scarcely do better than guess even its *approximate* measurements.

Hence there is no practical use in trying to define and teach the measurements of the average female pelvis with that extreme precision (down to the smaller fractions of an inch) attempted in many obstetric text-books. It complicates the matter without any special advantage; an approximate precision is all that is requisite—all that is possible.

Diameters of the Superior Strait (see Fig. 1, page 26):

First. The *antero-posterior* (sacro-pubic, "conjugate," "*conjugata vera*," or true conjugate), extending from the middle of the sacral promontory to the *top* of the symphysis pubis.

Second. The *transverse* (bis-iliac), extending across the widest part of the strait, from one lateral margin of the brim to the other.

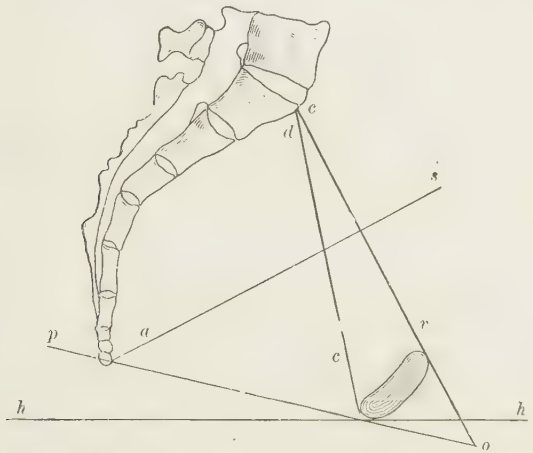
Third. The *right oblique* (diagonalis dextra), extending from the right sacro-iliac synchondrosis to the left acetabulum (or left ilio-pectineal eminence, which is nearly the same thing).

Fourth. The *left oblique* (diagonalis læva), extending from the left sacro-iliac synchondrosis to the right acetabulum.

Fifth. The *diagonal conjugate* (conjugata diagonalis), extending from the middle of the sacral promontory to the *lower end* of the pubic symphysis. Since the pubic end of this diameter is really at the *inferior* strait, it is not, strictly,

one of the diameters of the *superior* strait, but a diagonal between the two straits, as its name expresses. (See Fig. 4, *d–c.*)

FIG. 4.



c–v. Conjugate diameter of superior strait. *d–c.* Diagonal conjugate. *a–s.* Axis of plane of superior strait. *p–o.* Plane of the outlet, or inferior strait. *h–h.* Line of the horizon. In this figure the woman is supposed to be standing erect.

DIAMETERS OF THE INFERIOR STRAIT (Fig. 2, page 31):

First. The *antero posterior* (coccy-pubic, called also "conjugate"), extending from the tip of the coccyx to the lower end of the symphysis pubis.

Second. The *transverse* (bis-ischiatic), extending across the outlet from one tuberosity of the ischium to the other.

Third. The *oblique* (of which, of course, there are two; right and left, as at the brim), extending from about the middle of the lower border of the great sacro-sciatic ligament of one side to the thickened portion of bone where the descending ramus of the pubis joins the ascending ramus of the ischium, or thereabouts, on the other.

DIAMETERS OF THE PELVIC CAVITY:

First. The *antero-posterior* (conjugate), extending from the centre of the symphysis pubis to the centre of the hollow of the sacrum.

Second. The *transverse*, extending across from a point nearly opposite the lower edge of the acetabulum on one side to a corresponding point upon the other.

Third. The *oblique* (of which there are two, right and left), extending from the centre of the great sacro-sciatic foramen on one side to the obturator foramen on the other.

(The diameters of the *cavity* are not so important as those of the brim and outlet.)

The Average Approximate Length of the diameters of the pelvic canal in the living woman is as follows:

Antero-posterior of the brim, or superior strait	4 inches, 10.1 cm.
Transverse of the brim in the living female	4 inches, 10.1 cm.

(The transverse is 5 inches, 12.7 cm., in the dried pelvis, owing to removal of the psoas magnus muscle, which takes up half an inch of space on each side, in the recent pelvis.)

Obliques of the brim (right and left alike)	4½ to 5 inches, 11.4 to 12.7 cm.
Diagonal conjugate	4½ inches, 11.4 cm.
Antero-posterior of the outlet or inferior strait	4½ to 5 inches, 11.4 to 12.7 cm.
Transverse of the outlet	4 inches, 10.1 cm.
Obliques of the outlet (right and left alike)	4 inches, 10.1 cm.
Antero-posterior of the cavity	5 inches, 12.7 cm.
Transverse of the cavity	5 inches, 12.7 cm.
Obliques of the cavity (right and left alike)	5 inches, 12.7 cm.

The most important fact developed by these measurements is that the brim is longest in its oblique diameters, while the outlet is longest in its antero-posterior measurement, which explains the necessity of what is called "rotation" in the mechanism of labor.

In addition to these measurements of the pelvis it is neces-

sary to remember the depth of its walls; thus, the depth of the *anterior wall*—*i. e.*, from the top to the bottom of the symphysis pubis—is 1½ inches, 3.8 cm.; while the depth of the *posterior wall*, from the sacral promontory to the tip of the coccyx (the line being a chord of the sacro-coccygeal curve), is just three times as long, viz., 4½ inches, 11.4 cm. The depth of the lateral wall is not of much importance: it is about 3½ inches, 8.8 cm.

In measuring the pelvis of the living female, externally, for the detection of deformity, it is necessary to remember the following:

1. Between the widest part of the iliac crests 10½ inches, 26.6 cm.
2. Between the anterior superior spinous processes of the ilia 9½ inches, 24.1 cm.
3. Between the front of the symphysis pubis and the spinous process of the upper bone of the sacrum 7½ inches, 19 cm.

In this last measurement a deduction of 3½ inches, 8.8 cm., must be allowed for the soft parts and thickness of the bones, which would then leave 4 inches, or 10.1 cm.—the normal conjugate diameter of the brim, as we have already seen.

Muscular Structures of the Pelvis.—*Above* the brim the muscles of the abdominal walls complete the wall of the "false" pelvis, where its bony wall is deficient in front, and they form the abdominal cavity, roofed above by the diaphragm, which agrees somewhat in shape with the full-term gravid uterus, so that by the contraction of the abdominal muscles and diaphragm during the pains of labor the womb is tightly embraced by them, and assisted in its expulsion of the child. *At* the brim we find the psoas magnus, which, arising from the side of the last dorsal and from the sides of all the lumbar vertebræ, passes down and crosses the brim, where it takes up half an inch of space at each end of the transverse diameter of the superior strait, to be inserted, with the conjoined tendon of the iliacus internus muscle, into the lesser trochanter of the femur. The action of these two muscles is to flex the thigh upon the pelvis and rotate the femur outward, and as this is the posture usually assumed by

the parturient female, the muscles are prevented from being stretched taut, and thereby encroach less on the brim, and thus offer less obstruction to the passage of the child.

Structures forming the Floor of the Pelvis and making a Bottom to the Basin.—The pelvic floor ("pelvic diaphragm") is composed, chiefly, of fascia, muscles, and connective tissue. Its superior surface is lined by peritoneum. Next below, and in close contact with the peritoneum, comes the tough, elastic, "internal pelvic fascia," which is attached to the pelvic brim. Here it meets from above the fascia transversalis of the abdominal wall and the fascia lining the iliac fossæ. Below the brim it is firmly attached to the periosteum, and forms a tendinous arch (*arcus tendineus*) reaching from the inner border of the pubes to the spine of the ischium; from this arch it extends to the median line of the body. Immediately below the internal pelvic fascia are two thin muscles, viz.: 1st. The *levator ani*, each half of which arises from the body and horizontal ramus of the pubes and from the arcus tendineus, and passes downward and inward to meet its fellow of the opposite side in the median line, where it is inserted into a tendinous raphe extending from the coccyx to the rectum, while some fibres pass between and to the sides of the bladder and rectum, and to the vaginal and rectal sphincters. 2d. The *ischio-coccygeus* (called also simply "coccygeus"), which is a narrow, triangular slip, situated parallel with and posterior to the levator ani, closing in a little space which the latter muscle, as it were, failed to cover. It arises by its apex from the ischial spinous process, and is inserted into the side of the coccyx. Below these muscles the pelvic floor is further strengthened by another layer of fascia—the *perineal fascia*. Its posterior portion—consisting of a single layer—is attached to the sides of the pelvis and arcus tendineus, from whence it is reflected over the inferior surface of the levator ani muscle, while its anterior part is divisible into a *deep* layer (covering the lower surface of the levator ani), a *median* and a *superficial* layer. Within these latter layers are lodged the pudic vessels and nerves, and the superficial muscles of the perineum. These muscles are (1) the *constrictor vaginæ*, each lateral half of which arises, posteriorly, from the perineal fascia midway between the anus and ischium (a small slip only passing to join the sphincter ani muscle), and passes for-

ward to unite, by aponeurosis, with its fellow of the opposite side, near the clitoris; (2) the *sphincter ani*, which arises from the tip of the coccyx and is inserted into the tendinous centre of the perineum; (3) the *transversus perinei*, a narrow, transverse slip arising from the ascending ramus of the ischium, and inserted into the sides of the vagina and rectum.

To the several structures of the pelvic floor above given must now be added the integument and the very numerous interstitial layers of elastic connective tissue, which latter weld the parts together and add strength and elasticity to the whole fabric.

Besides their motor function, the muscles covering the inner surface of the pelvis (including the pyriformis—not yet mentioned—which arises chiefly from and covers the hollow of the sacrum) provide a sort of muscular upholstery to the interior of the pelvis, by which its bony lines and prominences are cushioned over, so as to prevent injury to the soft parts during the passage of the child, while the infant itself receives the same protection.

CHAPTER II.

THE FŒTAL HEAD.

The head of the fœtus requires special study, because, from its size and incompressibility, it is the most difficult part of the child to deliver; when the head is born, the rest of the labor is usually completed in a few minutes. The child's head, however, is not absolutely incompressible. Its bony wall is elastic to a certain extent in all parts except the base. By this arrangement, yielding of the bones permits pressure only upon the *upper part* of the fœtal brain, where, when moderate in degree, it is harmless; the same pressure upon the *base of the brain and medulla* would be fatal. While it is not true that the short transverse diameter of the child's head, viz., from one parietal protuberance to the other, is less than the transverse diameter of the trunk, viz., from one acromion process of the scapula to the other, still the bones and

muscles of the arms, shoulders, and trunk are so mobile and flexible that, when they are jammed into the pelvis, the bis-acromial diameter is capable of being easily reduced to a less width than the transverse diameter of the skull; hence the head, though apparently *not*, practically *is* wider than across the shoulders.

Shape of the Fœtal Head.—This does not correspond perfectly to any geometrical figure, but it will best suit our purpose to consider it ovoid or egg-shaped—the chin corresponding to the small end of the egg, the occiput to the large end, and the widest transverse circumference passing over the parietal protuberances. One aspect of the ovoid, viz., its base, is considerably flattened, and so are the sides of the head, but to a less extent.

The fœtal cranial bones are imperfectly ossified (and are therefore elastic); their sutural borders are surmounted by a rim of cartilage, and the cartilaginous rims of two contiguous bones are only united by bands of fibrous tissue which become ossified later. The bones are further held in apposition by the dura mater, pericranium, and skin; their borders, however, can be pressed closer together, or even made to lap one over the other, during parturition. The posterior borders of the parietal bones especially overlap the anterior borders of the occiput. The union of the upper, squamous part of the occipital bone with its basilar portion being only fibro-cartilaginous in character, this junction is somewhat movable, like a joint; hence pressure upon the prominence of the occiput easily depresses its anterior borders beneath the posterior borders of the parietal bones. The distance between the two malar bones can be reduced, by compression, only in a very slight degree.

The base of the skull is sufficiently ossified as to be *in*compressible; it is, however, narrower than the top of the skull, and needs no reduction in size to facilitate its passage through the pelvis in ordinary cases.

Sutures of the Cranium.—They are:

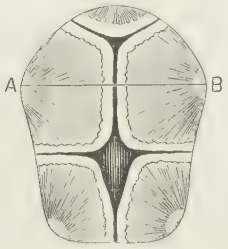
First. The *coronal* suture (or *fronto-parietal*), passing between the posterior border of the frontal bone and the anterior borders of the two parietals. It goes over the arch of the cranium from one temporal bone to the other.

Second. The *sagittal suture* (or *biparietal*), running along and between the superior borders of the two parietal bones and extending from the superior point of the occiput to the os frontis. It must be noted, however, that, in the fœtus, the two halves of the frontal bone have not yet united; they are divided by what is called the *frontal* suture almost to the root of the nose, and by some writers this frontal suture is regarded as a continuation of the sagittal.

Third. The *lambdoidal* suture (or *occipito-parietal*), running between the superior, or rather antero-lateral, borders of the occiput and the posterior borders of the parietals, and extending from near the mastoid process of one temporal bone to that of the other.

Fontanelles.—The *fontanelles* are spaces left in the skull at points where the angles of two or more bones finally meet. They are due to deficient ossification, and are explained by the general principle that ossification, beginning near the centre of a bone and extending toward its circumference, reaches the angles last because they are generally furthest from the centre. There are six fontanelles, but only *two* of them are of obstetric importance. These are the *anterior* (or fronto-parietal) fontanelle and the *posterior* (or occipito-parietal) one.

Fig. 5.



Showing the shape of fontanelles, the long acute angle of the anterior one pointing toward the nose. A–B. Biparietal diameter.

The shape of the *anterior* one may be approximately described by drawing lines between the four points of a crucifix; it is a four-sided figure, two of whose sides are equal—lozenge-shaped—the long, acute angle being formed by deficient ossification in the posterior superior angles of the two halves of the

frontal bone, and the short obtuse angle by deficient ossification in the anterior superior angles of the parietal bones. Its situation is where the coronal suture crosses the sagittal. In size it is a considerable membranous space, easily recognized by the finger, and often by the eye, and through it the motion of pulsation in the cerebral arteries may be both seen and felt. It is not completely closed till one or two years after birth. Remember particularly that the *long* angle of this fontanelle points toward the forehead and nose; the short one toward the occiput. (See Fig. 5, page 43.)

The *posterior* fontanelle is much smaller in size, being simply a triangular depression situated at the point where the sagittal suture meets the lambdoidal; radiating from it are *three* sutural arms, viz., the sagittal suture and the two arms of the lambdoidal. It closes a few months after birth.

The other four fontanelles, two on each side, are placed at the inferior angles of the parietal bones. They are unimportant.

Regions of the Fœtal Skull.—One of the most important is the vertex. Literally this means the highest part or "crown" of the head; but when in midwifery we speak of a "vertex presentation," we refer to a more posterior region of the skull, which I have already compared to the larger, rounded extremity of an egg, and which has (I think very properly) been termed by some writers the "obstetrical vertex;" it may be defined as a circular space whose centre is the apex of the posterior fontanelle, and the circumference of which passes over the occipital protuberance.

Other regions of the fœtal head have been described, but they are not of great importance, viz., the "base" or flattened surface directed toward the neck, and the facial, frontal, and lateral regions, which explain themselves.

The space occupied by the anterior fontanelle is sometimes called *sinciput*, or *bregma*.[1]

Diameters of the Child's Head, and their Approximate Average Length. (Fig. 6, page 46.)

The *occipito-mental*, extending from the point of the chin to the superior angle of the occiput 5½ inches, 14 cm.

[1] The terms "*vertex*," "*sinciput*," and "*bregma*," are defined so differently by different authors that I shall avoid using them as far as practicable. See Appendix on Uniformity in Nomenclature, etc., at the end of this book.

The *occipito-frontal*, extending from the centre of the forehead to a point on the median line of the occiput a little above its protuberance	4½ inches,	11.4 cm.
The *biparietal*, passing transversely from one parietal protuberance to the other	3½ inches,	8.8 cm.
The *cervico-bregmatic* (called also "trachelo-bregmatic"), passing vertically from the posterior angle of the anterior fontanelle to the anterior margin of the foramen magnum	3½ inches,	8.8 cm.
The fronto-mental, going from the top of the forehead to the end of the chin .	3½ inches,	8.8 cm.
The bi-temporal, going across from one temporal bone to the other, between the two lower extremities of the coronal suture	3¼ inches,	8.2 cm.
The suboccipito-bregmatic, going from the union of the neck and occiput to the centre of the anterior fontanelle .	3¾ inches,	9.5 cm.

Several other cranial diameters are given in some of the text-books, and the number might be indefinitely multiplied, but the above are all that require to be remembered.[1]

One other measurement (of great importance when considering the mechanism of face presentations) may be added, viz., the sterno-mental length of the child's *neck* when the chin is removed as far as possible from the sternum; it is 1½ inches—exactly the same as the depth of the symphysis pubis.

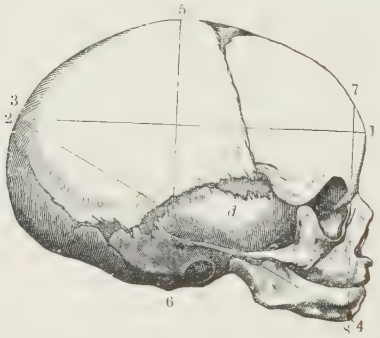
Articulation and Movements of the Head.—The motions of flexion and extension are provided for, in part, by the articulation of the occipital condyles with the atlas, and, in part,

[1] It should be noted that the head may be pressed out of its natural shape ("moulded") during delivery, and the direction of such distortion will vary with the kind of presentation, and consequently the cranial diameters will vary accordingly.

Again, let it be remembered that the object of measuring any particular diameter is to get the dimension of the head in that one direction, and, while authorities constantly differ as to the exact points on the skull at which the extremities of their diameters are to be placed, the practical principle in measuring crania may be illustrated thus: The occipito-mental diameter *starts* at the point of the chin, and ends at some opposite point on the median line of the occiput *furthest removed from the point of starting;* the occipito frontal *starts* at the most anteriorly projecting part of the median line of the forehead, and ends at a point on the median line of the occiput *furthest removed from the point of starting;* and so of the other diameters.

by the articulations of the cervical vertebræ. The motion of rotation (which cannot be forced beyond the fourth of a circle without danger) is provided for chiefly by the articulation of the atlas with the axis, and partly by the joints between the

Fig. 6.



Diameters of fœtal head. 1–2. Occipito-frontal. 3–4. Occipito-mental. 5–6. Cervico-bregmatic (or vertical). 7–8. Fronto-mental.

other cervical vertebræ. The articulation of the atlas with the cranium, being nearer the occipital than the opposite pole of the head, is of importance in promoting "flexion" during labor, as will be explained further on. (See Chapter XIV.)

CHAPTER III.

EXTERNAL ORGANS OF GENERATION.

The structures generally included in the external generative organs of the female are: the mons veneris, labia majora, labia minora (nymphæ), clitoris, vestibule, urethra and its meatus, the fossa navicularis, hymen, and caruncule myrtiformes. The term "vulva" is generally used to express all of the genital structures just mentioned except the mons veneris. The term "*pudenda*" has a similar meaning.

The Mons Veneris (*mont de Venus*) is a cushion of adipose, cellular, and fibrous tissue, situated upon the front of the symphysis and horizontal rami of the pubes. Its thickness varies with the obesity of the individual, and its prominence differs according to the degree of projection of the pubes. After puberty it is covered with hair, and is abundantly supplied with sweat and sebaceous glands. Its function is not positively known. It possibly serves the purpose of a brow, in preventing irritating secretions from the skin trickling into the vulvar fissure.

The Labia Majora, called also "Labia Externa" and "Labia Pudendi," are the lips of the genital fissure, placed side by side in an antero-posterior direction. They begin at the lower part of the mons veneris (as if by a bifurcation of that structure), which is their thickest part, and pass at first downward, then horizontally backward, becoming thinner in their course, and join each other at a point about one inch in front of the anus. Their point of junction in front is called the *anterior commissure*, and their point of apposition[1] behind, the *posterior commissure*.

Like the lips of the mouth, they are covered internally with a layer of mucous membrane containing mucous follicles, and externally with integument which contains hair follicles and sebaceous glands. Under the skin is a thin layer of unstriated muscular fibres—the "woman's dartos"—and beneath this, embedded in adipose and connective tissue, a pear-shaped sac, the narrow neck of which is continuous with the external inguinal ring. It is known as "Broca's pouch;" contains fat and connective tissue, and occasionally, in young subjects, a process of peritoneum, homologous with the processus vaginalis of the male, known as the "canal of Nuck." This canal usually becomes obliterated, but may sometimes persist and become the seat of hernia. It follows the course of the round ligament of the uterus, some of the fibres of which terminate in the labia majora.

The Fossa Navicularis.—Just before the labia come together posteriorly they are united by a transverse fold of

[1] The labia do not unite posteriorly *at an angle*, but running side by side, close to each other, the vulvar fissure terminates in a sort of horizontal "gutter" continuous with the perineum; hence I have applied the term "apposition" instead of "junction" to the posterior union.

mucous membrane (which somewhat resembles the web of skin between the thumb and finger) called the *fourchette* (or frænulum pudendi), and the little, depressed space between this and the posterior commissure is the *fossa navicularis*. It is generally obliterated after labor by rupture of the fourchette.

The Labia Minora, or Nymphæ, are thick, double folds of mucous membrane, about one inch and a half long, which begin by gradually projecting from the inner surface of the labia majora, midway between the two commissures. They then pass forward until reaching the clitoris, when they split horizontally into two folds. The upper folds pass above the clitoris, and, joining in the median line, contribute to form the *prepuce* of that organ, while the lower ones join underneath, forming its *frænum*. The nymphæ are covered with tessellated epithelium; they contain connective and muscular tissue, vascular papillæ, and sebaceous glands. They are very vascular, also erectile, and secrete an odorous sebaceous mucus which lubricates their surface and prevents adhesive union. Their function is not certainly known.

The Clitoris is a small, erectile body, about one inch in length, placed just inside the vulvar fissure, half an inch behind the anterior commissure. It is composed of two corpora cavernosa, which are united in the median line and end anteriorly in the glans clitoridis, but separate from each other posteriorly to form the two crura, which are attached to the rami of the pubes and ischia. It is considered to be the analogue of the penis, but differs from this organ in having no corpus spongiosum or urethral canal. The vascular bulbs of the vestibule and the intermediate plexus of veins uniting them on each side with the vessels of the clitoris, would, if united in the median line, represent the corpus spongiosum of the penis and bulb of the male urethra. The clitoris has two erector muscles; it is abundantly supplied with vessels and nerves, and constitutes the principal seat of sexual sensation. It is secured to the pubis by a suspensory ligament.

The Vestibule is a triangular surface of mucous membrane whose base is the anterior margin of the vaginal orifice; its apex terminates at the clitoris, and its two sides are bounded

by the nymphæ. It is of little importance except as a guide for finding the *meatus urinarius*, placed near its lower margin.

On each side of the orifice of the vagina, enclosed in a thin layer of fibrous tissue, under the labia majora, is a spongy, oblong mass of small, convoluted veins, which, when distended during sexual excitement, assumes, in its entirety, the form of a filled leech or of a diminutive banana. These are called the *bulbi vestibuli*, sometimes the *vaginal bulbs*. Their veins are continuous with those of the clitoris and vagina.

The Female Urethra is one inch and a half in length; is larger than that of the male, and more easily dilatable; it begins at the meatus, which is situated immediately below the rim of the pubic arch, and passes backward, curving a little upward, to the neck of the bladder. It is composed of a mucous, muscular, and vascular coat. About one-eighth of an inch within the meatus are the openings of two tubular glands, just large enough to admit a No. 1 probe of the French scale. These glandular tubules run parallel with the long axis of the urethra, beneath the mucous membrane, in the muscular wall. They vary from three-eighths to three-fourths of an inch in length.

The Hymen is a crescentic-shaped fold of mucous membrane whose convex border is attached to and continuous with the posterior wall of the vaginal orifice, just inside the fourchette. Its sides then run upward to terminate in the horns of the crescent, which last are united by its anterior concave border. It varies in form in different women. Sometimes the horns of the crescent, instead of coming to a point, are continued as a narrow band to the anterior vaginal wall, where the ends join each other, leaving a circular or oval opening in the centre ("annular hymen"). Occasionally it covers the orifice of the vagina entirely ("*imperforate hymen*"), or it may present a number of very small openings ("*cribriform hymen*"). It also varies in thickness and strength. It is usually ruptured by the first act of *coitus*, though not always, and may be torn by other causes, so that it is by no means so sure a sign of "virginity" as was formerly supposed. Sometimes the inner border of the hymen has a fringed appearance, resembling the end of a Fallopian tube

(hence called "hymen fimbriatus"): this might be mistaken for a normally ruptured hymen. Moreover, it is sometimes absent altogether.

The Myrtiform Caruncles (Caruncul.e Myrtiformes). —Formerly these were said to be shrivelled, projecting remains of the ruptured hymen; subsequently they were considered to be vascular, membranous prominences placed immediately behind the hymen, and quite independent of it. More recently they have been ascribed to childbirth, pressure of the child's head during labor causing necrosis and sloughing of the previously torn hymen, of which, therefore, these so-called caruncles are the only visible remains. This last view is probably correct, and explains why the caruncles are often absent.

CHAPTER IV.

INTERNAL ORGANS OF GENERATION.

The Internal Organs of Generation are the vagina, uterus, Fallopian tubes, and ovaries.

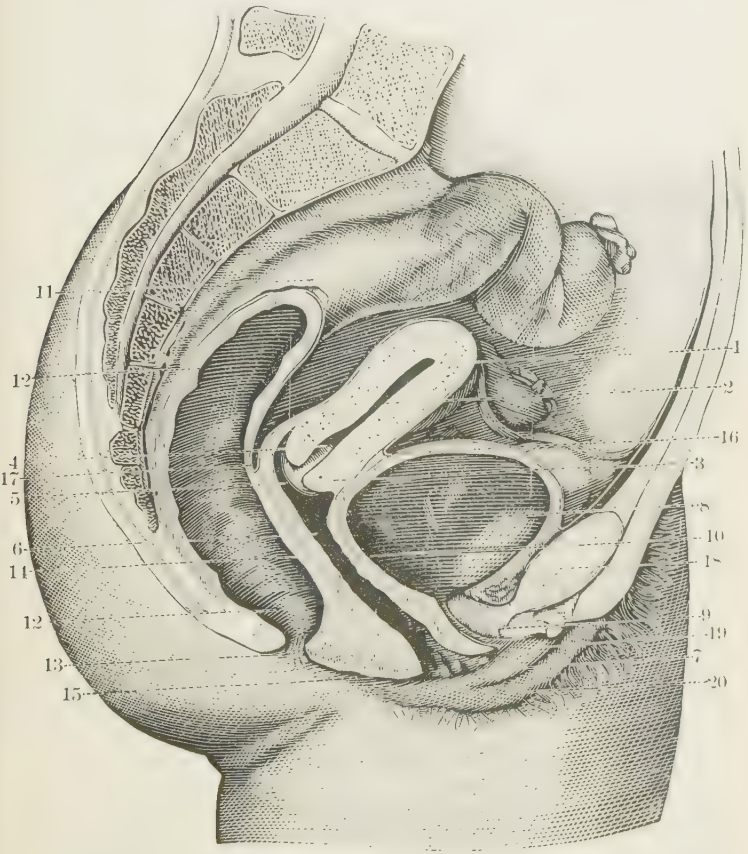
The Vagina is a membranous canal extending from the vulva to the uterus, hence sometimes called the "vulvo-uterine canal."

It is made up of a mucous membrane (covered with pavement epithelium), continuous with that of the vulva and uterus. Outside the mucous coat is a thin, muscular layer, continuous with the uterine muscles, whose fibres run, some longitudinally, some in a circular direction, and others obliquely. The muscular coat becomes thicker during pregnancy. It is extremely vascular, its vessels being so disposed as to constitute an erectile tissue, especially toward the vulva. Cellular and fibrous tissues also enter into the composition of the vaginal wall.

Underneath the epithelium of the mucous membrane are a large number of vascular papillæ. Along the median line of the anterior and posterior vaginal walls there is a vertical

ridge in the mucous membrane (the "anterior and posterior columns" of the vagina), and diverging from these, laterally,

FIG. 7.



Female generative organs, as seen in longitudinal section through the median line of the body. 1. Body of uterus. 2. Cavity of body. 3. Cervix uteri. 4. Cavity of cervix. 5. Os uteri. 6. Cavity of vagina. 7. Vaginal orifice. 8. Bladder. 9. Urethra. 10. Vesico vaginal septum. 11. Rectum. 12. Cavity of rectum. 13. Anus. 14. Recto-vaginal septum. 15. Perineum. 16. Vesico-uterine cul-de-sac. 17. Recto-vaginal cul-de-sac, or cul-de-sac of Douglas. 18. Symphysis pubis. 19. Nympha. 20. Labium majus. (From BARNES, after TARNIER AND SAPPEY.)

the mucous coat is thrown into transverse ridges which admit of dilatation of the canal during labor.

Its posterior wall is about three and a half inches long, its anterior wall about three inches. Its diameter is a little above an inch. At rest, the anterior and posterior walls are in contact with each other.

With regard to the exact situation and direction of the vagina, the descriptions and illustrative plates of anatomists differ widely. Roughly speaking, according to Leishman, "it lies in the axis of the pelvis, but its axis is placed anterior to the pelvic outlet, so that its lower portion is curved forward."

Its attachments to adjoining organs are as follows: the posterior wall is connected by its *middle three-fifths* with the rectum, the united walls constituting the recto-vaginal septum; its *lower fifth* is separated from the rectum, and is in contact with the perineal body; while its *upper fifth* is in contact with the fold of peritoneum which descends behind the womb to form Douglas's *cul-de-sac*. Its anterior wall is united by connective tissue with the posterior walls of the bladder and urethra, constituting, respectively, the vesico-vaginal and urethro-vaginal septa. (See Fig. 7, page 51.)

The upper extremity of the vaginal cylinder surrounds and is attached to the neck of the uterus: it is called the *fornix*.

On each side of the orifice of the vagina are the *bulbi vestibuli* already described. Immediately beneath and behind the posterior round extremity of this bulb of the vestibule is placed, on each side, the *vulvo-vaginal gland* (analogue of Cowper's gland in the male, and variously called the gland of Huguier and of Bartholin). It is a conglomerate gland, varying in size from a horse-bean to an almond, and secretes, during sexual excitement, an exceedingly viscid mucus, which is discharged from the orifice of the gland-duct into the fossa navicularis.

The vagina is abundantly supplied with nerves, especially toward its orifice, where it is endowed with a peculiar sensibility. Its arterial supply is derived from the uterine, hypogastric, vesical, and pudendal arteries; and its numerous venous plexuses, continuous with those of the vulva, clitoris, and uterus, terminate in the hypogastric veins. The vaginal veins have no valves.

The Uterus is a thick-walled hollow organ, in the form of a truncated cone, slightly flattened antero-posteriorly, situated in the middle of the pelvic cavity, its upper end being a little below the plane of the superior strait. The bladder is in front of it, the rectum behind, and the vagina below it. The small intestine rests upon it from above. It has *three coats:* (1) a serous coat (peritoneum) on the outside; (2) a muscular coat, which gives thickness and solidity to the uterine walls, and is composed of non-striated muscular fibres arranged in layers, having different directions, circularly, longitudinally, and spirally, which are closely adherent to and decussate with each other; (3) a mucous lining continuous with that of the vagina and Fallopian tubes, and covered with ciliated, columnar epithelium. When a new mucous membrane begins to form in the uterus after menstruation the cells are *without* cilia; but the mature cells *are* ciliated, which accounts for some observers asserting that these cells are ciliated and others that they are not.

That portion of the neck of the uterus which projects into the top of the vagina is covered externally with pavement epithelium. This last joins the columnar epithelium of the interior of the uterus just within the external os uteri.

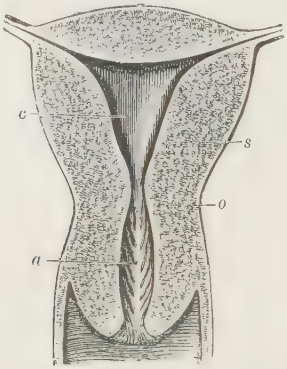
In length (counting the thickness of its upper wall) it is (roughly) about 3 inches; its width, transversely across its widest upper part, is 1½ inches; and its greatest antero-posterior thickness 1 inch. At the end of pregnancy it attains the size of a foot or more in length, and 8 or 10 inches transversely.

It is divided by anatomists into fundus, body, and neck. The *fundus* is all that rounded portion placed above a horizontal line drawn through the angles where the Fallopian tubes open into the womb; the *body* is all that portion between the fundus and the neck; and the *neck* is all that part below a line drawn horizontally through the organ at the level of the internal os uteri.

Its cavity is divided into the cavity of the body and the cavity of the neck. That of the body is triangular and flattened antero-posteriorly; it has three openings, those of the two Fallopian tubes above and that of the os internum below. The cavity of the neck is barrel-shaped or fusiform, and comparatively narrow; it is constricted above by the internal os, that separates it from the cavity of the body, and grows narrow again at its termination in the external os uteri. After

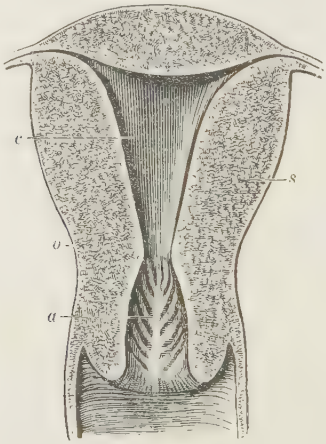
childbirth the constrictions of the internal and external os are less marked. (See Figs. 8 and 9.)

FIG. 8.



Section of the uterus before childbirth. *a.* Cavity of cervix. *c.* Cavity of body. *o.* Os internum. *s.* Uterine wall. (From BARNES, after TARNIER.)

FIG. 9.



Section of uterus after childbirth. The letters have the same meaning as in Fig. 8. (From BARNES, after TARNIER.)

MICROSCOPIC STRUCTURE OF THE UTERINE MUCOUS MEMBRANE.—It is composed of mucous follicles ("utricular

glands") placed perpendicularly to the internal surface of the womb. Their mouths open into the uterine cavity, and they terminate by rounded, bulbous extremities (some of which are bifurcated) upon the muscular coat. The follicles are lined with columnar epithelium; and some idea may be formed of their size ($\frac{1}{30}$th of a *line* in diameter) by remembering that there are about ten thousand of them in the mucous membrane of the *cavity* of the *neck* alone.

Broad Ligaments of the Uterus.—These are simply folds of peritoneum covering the external surface of the womb. Let us imagine a line drawn across the outside of the top of the fundus and prolonged transversely until it reach the sides of the pelvis. Beginning at this imaginary line a broad layer of peritoneum passes down over the *anterior* wall of the womb to the level of a point midway between the internal and external os, when it turns up and is reflected over the posterior wall of the bladder: this is the *anterior* broad ligament. A similar fold passes down over the posterior wall of the womb, going low enough to cover the upper one-fifth of the posterior *vaginal* wall (as already explained), when it turns up and is reflected over the anterior wall of the rectum: this is the *posterior* broad ligament. Thus the uterus, with (and between) its two broad ligaments, forms a sort of transverse partition to the pelvic cavity; the bladder, urethra, etc., being in the front compartment, and the rectum in the back one. The lateral borders of this double ligamentous curtain are attached to the sides of the pelvis, and hence these ligaments are sometimes called "right" and "left," instead of "anterior" and "posterior," as above.

Other Ligaments of the Uterus:

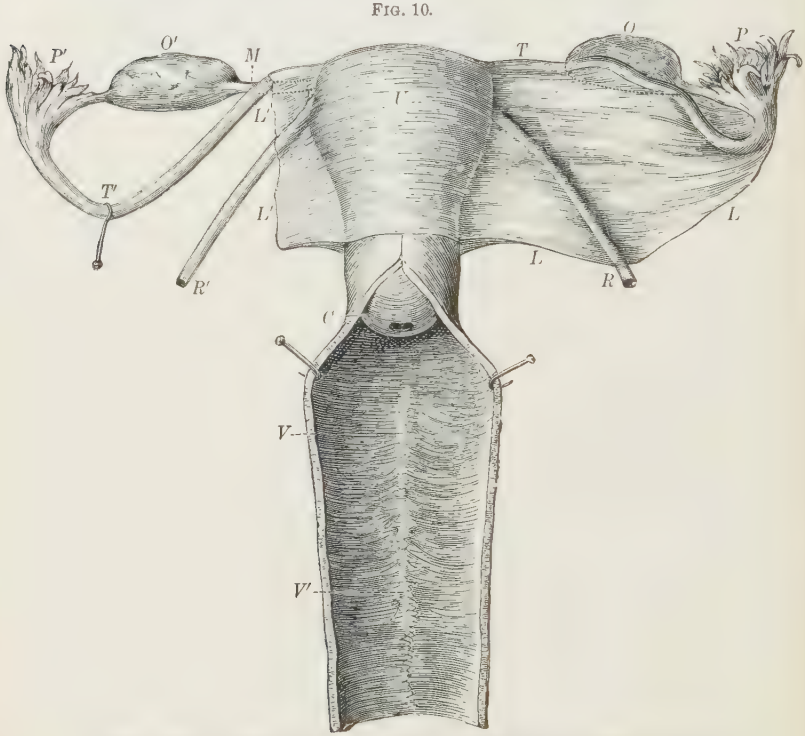
First. The *round ligaments*, which are fibro-*muscular* cords, 4½ inches long. They begin near the superior angles of the womb, and pass between the two folds of the broad ligaments, successively outward, forward, and then inward, to the internal inguinal ring, and through the inguinal canal, their terminal fibres being lost in the *mons veneris* and *labia majora*.

Second. The *vesico-uterine* ligaments: semilunar-shaped folds of peritoneum passing from the lower part of the body of the uterus to the fundus of the bladder.

Third. The *utero-sacral* ligaments: crescentic-shaped folds

of peritoneum passing from the lower part of the body of the uterus to be inserted into the third and fourth sacral vertebræ.

FIG. 10.



Anterior view of internal generative organs, ligaments, etc. Part of the broad ligament on the right side has been removed, and the anterior vaginal wall slit up by a central incision. *C.* Cervix uteri. *L.* Broad ligament of left side. *L'.* Broad ligament of right side. *M.* Utero-ovarian ligament. *O.* Left ovary. *O'.* Right ovary. *P.* Fimbriated end of Fallopian tube. *R.* Round ligament of left side. *R'.* Round ligament of right side. *T.* Left oviduct. *T'.* Right oviduct pulled down to show ovary. *U.* Uterus. *V.* Vagina. *V'.* Posterior column of vagina.

Fourth. There is still another short cord, containing many smooth muscular fibres, extending from near the upper angle of the uterus to the inner extremity of the ovary. It is about

one inch in length, and is called the *utero-ovarian* ligament—sometimes the "*ligament of the ovary.*" All the ligaments of the uterus contain some muscular tissue, which is increased during pregnancy. (See Fig. 10, page 56.)

FIG. 11.



Generative organs seen from above. M. Pubes. A, A. (In front.) Remainder of hypogastric arteries. A, A. (Behind.) Spermatic vessels and nerves. B. Bladder. L, L. Round ligaments. U. Fundus uteri. T, T. Fallopian tubes. O, O. Ovaries. R. Rectum. G. Right ureter resting on the psoas muscle. C. Utero-sacral ligaments. V. Last lumbar vertebra.

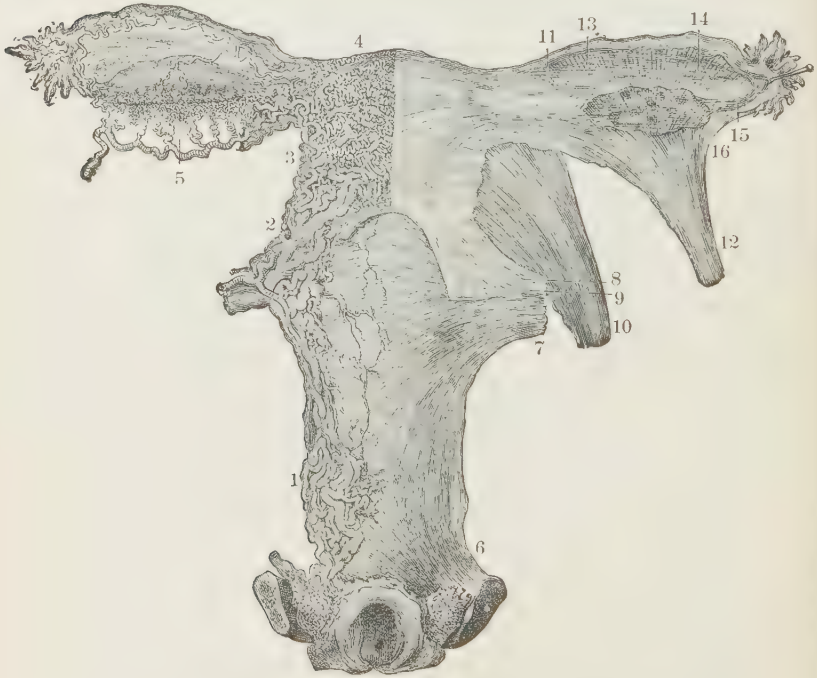
The relative position of the uterus and its ligaments, with adjacent organs, when seen from above, is shown in Fig. 11.

ARTERIES OF THE WOMB.—The *uterine* artery (one on each side) is a branch of the internal iliac. It descends behind the peritoneum to the fornix vaginæ, where its pulsation may be felt with the finger during pregnancy, and then ascends between the anterior and posterior folds of the broad ligament, along the side of the cervix and corpus uteri (to both of which it gives off many deeply penetrating branches), and, finally, its main trunk becomes directly continuous with the ovarian artery.

The *ovarian* artery (one on each side, corresponding with

the spermatic artery of the male) is given off from the aorta 2½ inches above its bifurcation. It descends into the pelvic cavity, and then ascends between the two folds of the broad ligament to the Fallopian tube, ovary, and fundus uteri, and

FIG. 12.



Posterior view of muscular and vascular arrangements. *Vessels:* 1, 2, 3. Vaginal, cervical, and uterine plexuses. 4. Arteries of body of uterus. 5. Arteries supplying ovary. *Muscular fasciculi:* 6, 7. Fibres attached to vagina, symphysis pubis, and sacro-iliac joint. 8. Muscular fasciculi from uterus and broad ligaments. 9, 10, 11, 12. Fasciculi attached to ovary and Fallopian tubes. (After RONGET.)

terminates by anastomosis with the uterine artery just described.

At the junction of the body and cervix uteri is a circumflex branch which unites the arteries of the two sides, and

which, when cut during surgical operations, bleeds profusely. The arterial branches in the uterine walls are remarkable for their numerous anastomoses and spiral course, the latter quality providing—it is supposed—for their longitudinal extension during pregnancy, a supposition that is very materially weakened by the fact that the arteries are *more* tortuous during pregnancy than before. Moreover, the arteries of the ovary present the same spiral course.

Veins of the Uterus.—These begin by small branches continuous with the fine plexus of capillaries into which the uterine *arteries* divide in the internal lining of the organ, and, inosculating freely with each other, unite to form larger veins (always *without* valves) in the substance of the uterine wall, whence they eventually pass out toward the folds of broad ligament, where, joining the ovarian and vaginal veins, a remarkable venous network is formed, known as the "*pampiniform plexus.*" (See Fig. 12, page 58.) On each side of the uterus, near its junction with the top of the vagina, the greater number of vessels in this plexus pour their blood into a trunk of considerable size—the internal spermatic vein—which empties on the right side into the vena cava and on the left into the left renal vein.

Nerves.—The nervous supply of the uterus is received chiefly from the sympathetic system—viz., from the hypogastric, renal, spermatic, and aortic plexuses.

There is no longer any doubt that it also receives branches from the cerebro-spinal system, derived chiefly from the second, third, and fourth sacral nerves. During pregnancy the nerve-fibres increase in size.

Lymphatics.—The womb is abundantly supplied with lymphatics, and its lymphatic vessels terminate in the pelvic and lumbar glands. It is chiefly through these lymphatic channels that septic matters are taken up from the cavities of the uterus and vagina, transported to other organs, and carried into the blood, thus producing septicæmia.

Functions of the Uterus.—It is the source of the menstrual discharge; it receives spermatic fluid from the male and the germ-cell—whether impregnated or not—from the

female; it provides a place for the fœtus during its development, and is the source of its nutritive supply; and it contracts at full term to expel the child.

During gestation *all* the tissues of the uterus undergo a decided physiological *hypertrophy*. After delivery they go through a sort of gradual physiological *atrophy*—back again to what they were before conception. The enlarged muscles especially undergo fatty degeneration and absorption—called "*involution*," in contradistinction to "*evolution*" or development. The process of involution requires a month or six weeks for its completion, sometimes longer.

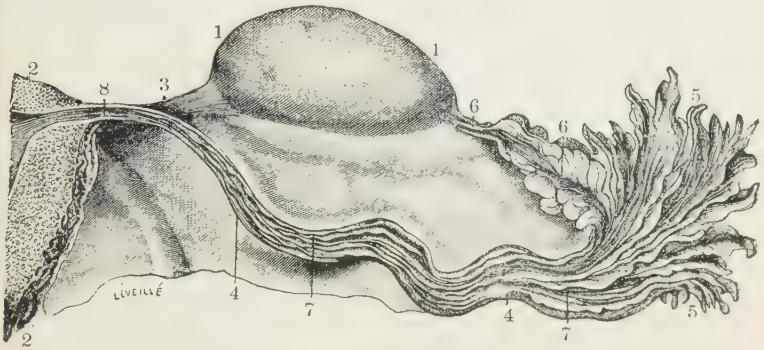
Mobility of the Uterus.—The womb in its normal condition is not fixed or adherent to any part of the skeleton, but enjoys considerable mobility; it is simply suspended or hung in the pelvic cavity by the tent-like aprons of peritoneum and other ligaments attached to it, as well as by its nerves, bloodvessels, and vaginal attachments. A full bladder pushes it backward; a distended rectum forward. It changes its position, by gravity, as the female changes her posture. Viewed through a speculum the vaginal part of its cervix may be seen to rise and fall with every motion of the diaphragm during respiration—an observation becoming still more apparent during the violent diaphragmatic motions that attend laughing, coughing, etc. Forcible injection of the uterine arteries after death causes the uterus to rise in the pelvis and execute a movement resembling that performed by the penis during erection, which leads to the supposition—difficult of proof—that this actually takes place during life under venereal excitement.

Fallopian Tubes.—Given off from the uterus, at each of its superior angles, is a tube whose canal is continuous with the uterine cavity. These are the Fallopian tubes (sometimes called "oviducts").

Each tube is about four inches long; near the uterus its diameter ($\frac{1}{25}$ of an inch) will just admit a bristle, but increases in size in its course from the womb toward the free distal end of the tube, where it is as large as a goose-quill. The tube passes from the uterus in a somewhat tortuous course, between the folds and along the upper margin of the broad ligament, toward the side of the pelvis, and terminates in a dilated,

trumpet-shaped extremity, the free margin of which is, as it were, frayed out into a number of fringe-like processes called "fimbriæ;" one of these, longer than the rest, is attached to the outer extremity of the ovary. Some of the fringed processes are continued as thin, leaf-like, longitudinal folds of mucous membrane into the dilated end of the tube, which grow narrower as they approach its uterine end, as shown in Fig. 13.

FIG. 13.



The ovary and oviduct. 1, 1. Ovary. 2, 2. Part of uterus. 3. Ovarian ligament. 4, 4. Oviduct, its wall opened by a longitudinal incision to show the longitudinal folds of its lining membrane. 5, 5. Pavilion, from internal surface. 6, 6. Fimbria attached to the ovary or tubo-ovarian ligament. 7, 7. Longitudinal folds. 8. Internal end of the oviduct.

Like the uterus, the Fallopian tubes are composed of three coats: 1. A *serous* (peritoneal) coat on the outside; 2. A *muscular* coat composed of two layers, viz., circular fibres (internally) and longitudinal ones (externally); 3. A mucous coat continuous with that of the uterus and lined with ciliated, columnar epithelium. At the distal end of the tube the mucous coat is continuous with the peritoneum, and furnishes the only instance in the body where a serous and a mucous membrane are thus joined.

FUNCTIONS OF THE FALLOPIAN TUBE.—It conveys spermatic fluid from the uterus to the ovary and conducts the germ-cell from the ovary to the uterus. When the ovule (germ-cell) is about to be discharged from the ovisac, the

fimbriæ of the tube grasp the ovary, so as to promote the safe entrance of the diminutive germ-cell into the trumpet-shaped mouth of the tube, whence it is conveyed, by peristaltic motion of the canal, into the uterus; this transmission of the germ is also assisted by the cilia of the epithelium, which wave toward the womb. The waving of the cilia is said also to produce a current, toward the tube, of the fluid covering the inner surface of the peritoneum near the fimbriated entrance, so that the ovule, when not at once received by the tube, may passively float into it afterward upon this moving fluid.

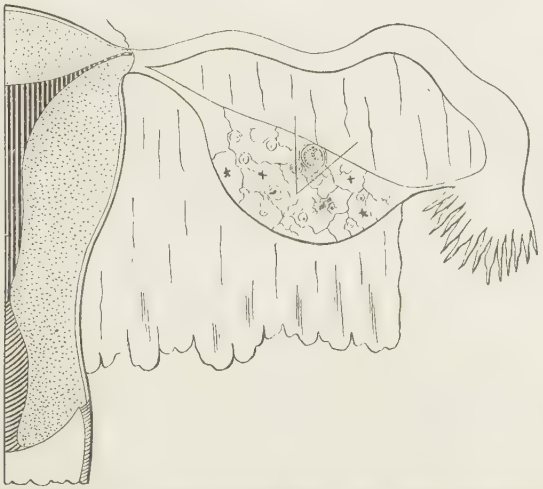
The Ovaries.—They are two in number (rarely three), and are placed one on each side of the womb, behind and below the Fallopian tubes. Formerly they were thought to be situated between the anterior and posterior folds of the broad ligament. This is incorrect. The ovary is really set "in a hole in the posterior layer of the broad ligament, as a diamond is fastened to a ring." The part projecting posteriorly, above and beyond the surrounding margin of broad ligament (as the diamond projects above its setting of gold), is therefore devoid of any peritoneal covering, the free surface thus exposed being the columnar epithelial layer of the ovary itself, as shown in Fig. 13, page 61, where a distinct line indicates the transition from peritoneum to ovarian epithelium.[1] The ovary is approximately almond-shaped, hence it has two ends, one of which is connected with the angle of the uterus by the fibro-muscular "ligament of the ovary," while the other is joined to the trumpet-shaped end of the Fallopian tube by one of the prolonged fimbria, known as the tubo-ovarian ligament, or *fimbria ovarica*. The ovarian blood-vessels pass up between the two folds of broad ligament and enter the organ in a little depression called the *hilum*. Each ovary is about one inch and a half in length, three-quarters of an inch wide, and one-third of an inch thick. Weight, one or two drachms.

Its *function* is ovulation—that is to say, the production, development, maturation, and discharge of ovules. Hence the ovaries are the essential organs of generation in the

[1] In Fig. 13 the whole ovary is represented pushed up out of place. If pushed down again to its normal position, it would be *below* the Fallopian tube, as shown diagrammatically in Fig. 14.

female, as the testicles are in the male. (Fig. 14 shows relations of ovary with uterus and Fallopian tube. A triangular

FIG. 14.



Relations of ovary with uterus and Fallopian tube. The two lines inclose a V shaped bit of the ovary, which is represented, largely magnified, in the next figure. Both figures are, of course, diagrammatic.

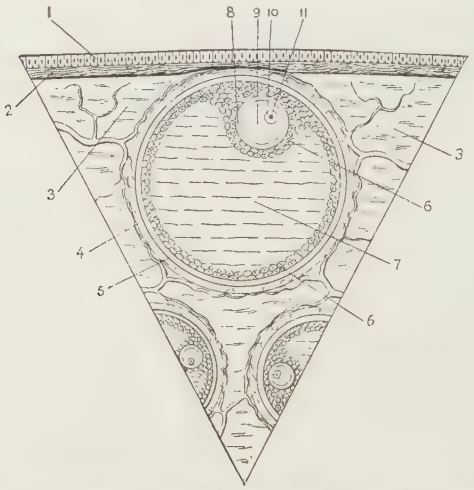
bit of ovarian stroma, showing ovum magnified, is seen in Fig. 15, page 64.)

STRUCTURE OF THE OVARY.—The ovary is covered externally with a layer of columnar epithelium, the cells being like those lining the Fallopian tube, except that the ovarian epithelium is *un*ciliated. This surface-epithelium is sometimes called "germinal epithelium," since some of its cells become, during fœtal life, deeply embedded below the surface, in the solid substance of the ovary, and thus constitute ovules.

Immediately beneath the external covering of epithelium is a thick coat of white, fibrous tissue, the *tunica albuginea*. Inside this last we find the solid substance of the ovarian body (the kernel of the ovarian nut, so to speak)—the *stroma*—composed for the most part of fibrous and muscular tissue, and traversed by numerous bloodvessels.

Dotted about in various parts of the stroma are little, round cavities, called "Graafian *follicles*." The wall of these globular follicular cavities is made up of the stroma substance itself, being in fact composed of a dense layer of the stroma's con-

FIG. 15.

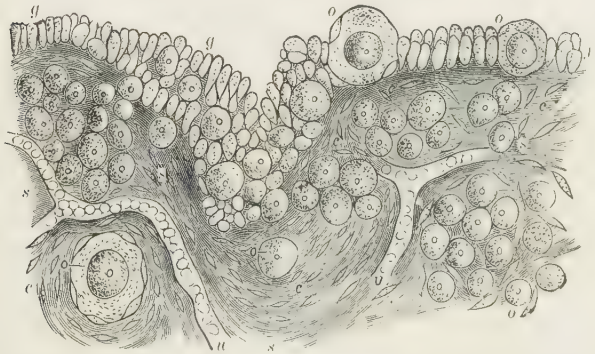


Triangular bit of ovarian stroma cut from ovary. Magnified to show Graafian follicle and ovule. 1. Epithelial covering of ovary. 2. Tunica albuginea (fibrous). 3, 3. Different parts of stroma. 4. Graafian follicle (tunica fibrosa). 5. Graafian vesicle or ovisac. 6, 6. Tunica granulosa. 7. Liquor folliculi. 8. Vitelline membrane, or zona pellucida. 9. Granular vitellus, or yolk. 10. Germinal vesicle. 11. Germinal spot.

nective or fibrous tissue, and is therefore sometimes called "*tunica fibrosa*." It is immediately surrounded on all parts of its periphery with an elaborate network of capillary blood-vessels. Fitting close inside and completely filling the "Graafian follicle" is the "Graafian *vesicle*" or "*ovisac*," sometimes termed, in contradistinction to the tunica fibrosa, the "*tunica propria*." Loosely adherent to the inside of the ovisac all around is a granular layer of epithelial cells, the "*tunica granulosa*." Inside this is the "*liquor folliculi*" (or fluid contents of the ovisac), in which floats the *human egg*, or *ovule*. It is only a yolk; there is no white to it, so that

the next membrane we have to encounter is the *zona pellucida* or *external* membrane of the egg, while next inside of this is the *internal* or *vitelline membrane;* between these two is a little space occupied by a fluid, called the peri-vitelline space. The egg embraced by the internal or vitelline membrane floats in the fluid of the peri-vitelline space within the zona pellucida. Embedded in the substance of the yolk is the "*germinal vesicle,*" and inside *that* the "*germinal spot.*" Besides the tunica granulosa covering the *inside* of the ovisac, a reflected layer of it is disposed all around the *outside* of the vitelline membrane. At birth it is said each human ovary really contains about 30,000 Graafian follicles, with their contents; but only the few that are approaching maturity are large enough to be seen with the naked eye. The ovules are therefore formed, for the most part, before birth, though their

FIG. 16.



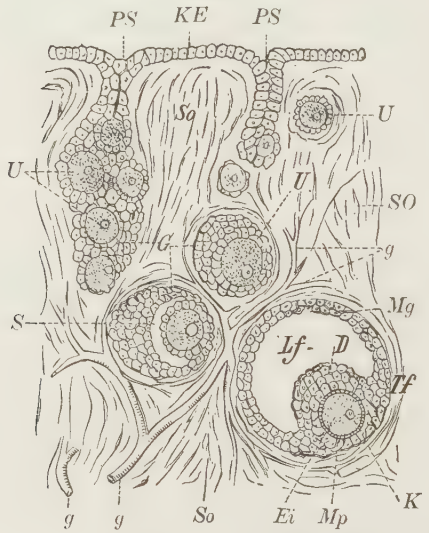
Vertical section through ovary of human fœtus. *g, g.* Germ epithelium, with *o, o,* developing ovules in it. *s. s.* Ovarian stroma containing *c, c,* fusiform connective-tissue corpuscles. *u, v.* Capillary bloodvessels. In the centre of upper surface of figure an involution of the germ epithelium is shown; and at the lower left side an isolated primordial ovule, with connective-tissue cells ranging themselves round it. (From PLAYFAIR, after FOULIS.)

formation is thought to continue in some instances two or three years later. Early in fœtal life the "primordial ova" were simply enlarged epithelium cells—germ epithelium—upon the external surface of the ovary. The way in which they become, later on, isolated ovules buried in the ovarian

stroma, is as follows: Cylindrical inflections of the epithelial covering of the ovary turn in and dip down into the substance of the stroma, forming a sort of tubule (like the follicle of a mucous membrane). The beginning of such a folding-in of the germinal epithelium is shown in Fig. 16, page 65.

While these inflections of germinal epithelium dip down into the ovarian stroma, the connective tissue of the stroma

FIG. 17.



Section through part of a mammalian ovary (after WIEDERSHEIM). *KE.* Germinal epithelium. *PS.* Inflected surface of epithelium, forming tubule or egg-cord. *U.* Primitive ova. *G.* Investing cells. *K.* Germinal vesicle. *S.* Follicular cavity arising in one of the older follicles. *Lf.* Follicular cavity more enlarged. *Ei.* Nearly mature ovum which has developed around it the zona pellucida. *Mp.* *Mg.* Membrana granulosa. *D.* Proligerous disk. *So.* Ovarian stroma. *Tf.* Graafian follicle. *g.* Bloodvessels.

itself grows up around them, and finally unites, cutting off the necks of the tubules, and thus burying them in the substance of the ovary, where they become ovisacs. The several stages of the process are shown in Fig. 17.

The way in which the ovule (egg, germ-cell) gets out of the ovary is as follows: As the Graafian follicle reaches maturity

it approaches the surface and begins to cause a protuberance (like a little boil) upon the outside of the ovary. Eventually the epithelial external coat, the tunica albuginea, the wall of the Graafian follicle (tunica fibrosa), and the wall of the Graafian vesicle (or ovisac), all burst at the same point, and out comes the vitelline membrane, safe and whole, with its contents, and clinging around it a loose, irregular mass of the "tunica granulosa," called the "*proligerous disk.*"

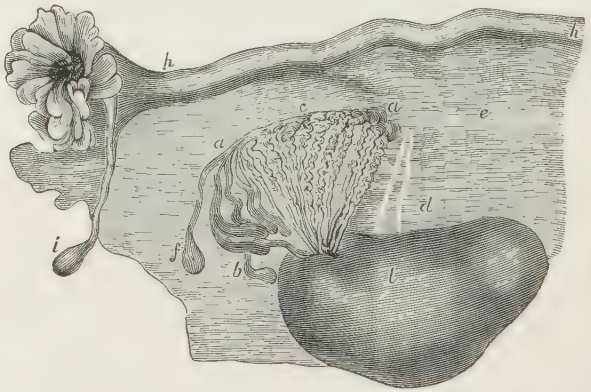
At the moment of rupture of the follicle, or shortly afterward, the ovule is received by the Fallopian tube and conveyed to the uterus.

THE CORPUS LUTEUM.—After discharge of the ovule, together with the liquor folliculi and that part of the tunica granulosa clinging to the ovule, the empty, deserted ovisac fills up with a clot of blood, to which are subsequently added newly proliferated cells of the membrana granulosa; wandering white corpuscles from the blood; and a "vitellus-like substance" of a *yellow* color containing granules and globules resembling those of the vitellus. The white blood-corpuscles accumulating near the wall of the vesicle press the remaining contents toward the centre of the cavity, while vascular papillæ project on all sides toward the centre. The larger vessels indenting the yellow mass impart to its exterior a folded appearance, formerly ascribed to convolutions in the wall of the ovisac. Eventually the contents of the sac are absorbed, and the follicle shrivels and contracts into an insignificant cicatrix or dimple. The yellow color of the contents of the ovisac has caused the site of the discharged ovule to be called "corpus luteum"—yellow body. Corpora lutea are of two kinds, "true" and "false." If the ovule be impregnated, a *true* corpus luteum is developed; if impregnation have not taken place, there results a *false* corpus luteum. The special (chief) differences between the two are as follows: 1st. The false corpus luteum increases in size for three weeks only, the true one continues to grow for about five months. 2d. After three weeks the false corpus luteum declines rapidly in size, and is reduced to a cicatricial dimple at the end of two months; while the true one, having grown so large as to occupy the greater part of the ovary by the fourth or fifth month, remains about the same size during the fifth and sixth months, then gradually declines during the

seventh, eighth, and ninth months, but it is not reduced to an insignificant cicatrix until one or two months after delivery. 3d. A true corpus luteum is single; a false one will be accompanied (either in the same or the opposite ovary) by the visibly evident remains of its predecessor. 4th. The cicatrix resulting from a true corpus luteum is more distinctly stellate than the cicatrix of a false one.

The Parovarium (sometimes called the "organ of Rosenmuller").—It is the remains of the *Wolffian body* of fœtal life, and corresponds to the epididymis of the male. Placed in the posterior fold of the broad ligament, where it may be seen by holding up the latter and looking through it by

Fig. 18.

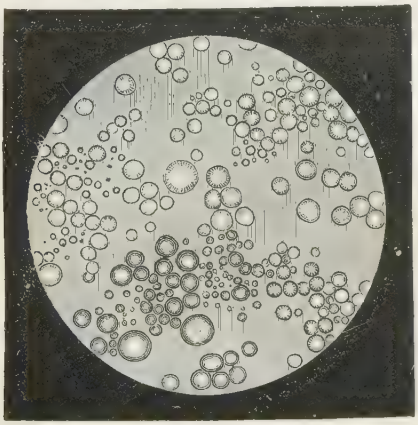


aa. Parovarium. *b.* Remains of the uppermost tubes of the Wolffian body. *c.* Middle set of tubes forming parovarium. *d.* Lower atrophied tubes. *e.* Atrophied remains of Wolffian duct or Gartner's canal. *f.* The terminal bulb or hydatid of the Wolffian duct. *h.* The Fallopian tube. *i.* Hydatid of Morgagni. *l.* Ovary.

transmitted light, it consists of from ten to twenty tortuous tubes arranged in a pyramidal form (like the ribs of a fan), the base of the pyramid, surmounted by a transverse tube with which the others communicate, being toward the Fallopian tube, its apex lost on the surface of the ovary. The parovarium has no excretory duct and no known function. It is chiefly of interest in that the accumulation of fluid in its tubes is often the beginning of cystic tumor of the broad ligament (see Fig. 18.)

THE MAMMARY GLANDS, whose function it is to secrete milk for the sustenance of the child after birth, properly belong to the reproductive system. In shape the gland is a flat, sometimes very flat hemisphere, its base resting upon the pectoralis major muscle, between the third and sixth ribs. By cutting a large orange transversely through its equator each half would give an approximate idea of the shape of the gland, and on the cut surface will be seen radiating trabeculæ, between which the pulp of the fruit is placed, that fairly resemble the radiating trabeculæ of fibrous tissue, fifteen or twenty in number,

FIG. 19.

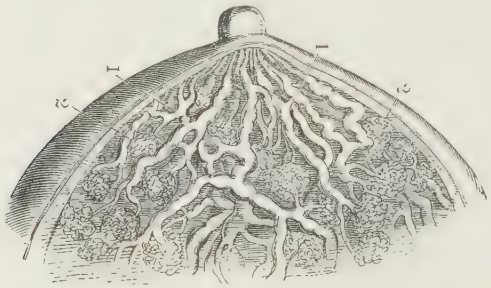


Globules of healthy milk ; fourteen months' lactation.

between which the so-called "lobes" of the secreting substance of the mammary gland are contained, and which are continuous with the circumferential fibrous capsule of the organ. The lobes are made up of lobules, and the lobules of terminal culs-de-sac (acini) lined with columnar epithelium. Each acinus empties its secretion (the milk being formed by desquamation, fatty degeneration, and rupture of the epithelial cells) through a little duct, which unites with others to form a larger duct for the lobule, and the lobular ducts unite to terminate in a still larger duct for each lobe, termed the *galactophorous duct.* The galactophorous ducts, fifteen or

twenty in number, one for each lobe, converge toward the nipple, becoming widely dilated as they approach it, but narrowing again as they actually enter it. The main ducts have non-striated muscular fibres in their walls, the contractions of which sometimes cause spurting of the milk from the nipples. (See Fig. 20.)

FIG. 20.



Lactiferous or galactophorous ducts.

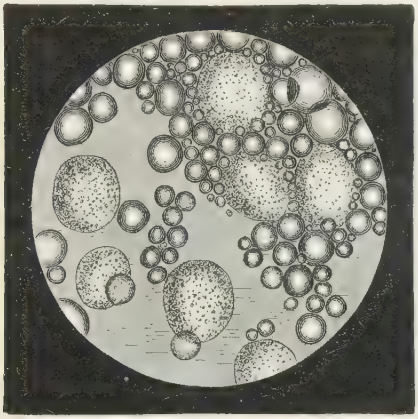
Viewing the breast externally, we see the apex of the mammary projection surrounded by a pink disk of skin called the *areola*. From the centre of the areola projects the *nipple*, and beneath the disk is a circular band of muscular fibres, which, in contracting, assists the expulsion of milk.

As already stated, milk is formed by breaking down of the cell wall of the epithelial cells lining the acini of the mammary glands, and liberation of the cell contents, consisting of fatty granules and liquid protoplasm. The secretion thus formed is rendered more fluid by a watery transudation directly from the bloodvessels. The free fatty granules coalesce and aggregate together, and thus form larger masses called milk-globules, which are still so small as to be microscopic, and constitute a fatty emulsion with the more fluid portion of the milk in which they float. (See Fig. 19, page 69.)

During the first day or two of lactation, however, the particles of fat are held together in masses of considerably larger size, having a granular appearance, and called "colostrum corpuscles," as seen in Fig. 21, page 71.

The mammary glands receive their blood-supply from the internal mammary and intercostal arteries. Their nerves are

FIG. 21.



Showing colostrum and ordinary milk globules, first day after labor; primipara, aged nineteen. (After HASSALL.)

derived from the intercostal and thoracic branches of the brachial plexus. They are also abundantly supplied with lymphatic vessels, which open into the axillary glands.

CHAPTER V.

MENSTRUATION AND OVULATION.

MENSTRUATION is a monthly hemorrhage from the uterine cavity.

It is called "*catamenial discharge*," "*menses*," and "*menstrual flow*," or in common parlance the "*monthly sickness*," the "*flowers*," the "*turns*," the "*courses*," the "*periods*;" or the woman is said to be "*unwell*."

We have already defined ovulation to be the development and maturation of ovules in and their discharge from the ovary. What relation has this process to menstruation?

About the time when an ovule is ripe and soon to be discharged, the reproductive organs, especially the ovaries and uterus, receive an extra amount of blood—they become physiologically congested in anticipation of impregnation taking place (for the menstrual period is really analogous with the period of "heat" or "rut" ("œstruation") in other animals); but in the absence of impregnation the extra blood-supply, which was designed to prepare the organs for the reception and development of an *impregnated* germ, fails of its natural purpose and is discharged in the form of menstruation. Menstruation is therefore dependent upon and more or less coincident with ovulation—this is the "*ovulatory theory*" of menstruation, so called. Objections have been urged against this theory. *First.* It is said the menses have recurred after removal of both ovaries. (Answer. This is extremely exceptional; the removal may have been incomplete; there is sometimes a third ovary;[1] the spayed women used as guards to the harems of Central Asia do not menstruate; finally the menstrual discharge, having been continued for years, may persist from *habit*, even after the original cause, viz., ovulation, has ceased to recur.) *Second.* It is alleged that women do not allow coitus and become impregnated *at* the menstrual periods, but always *between* the periods, from which it is inferred ovulation is *not* coincident with menstruation. (Answer. The human female, like other animals, is really more liable to impregnation when cohabiting near the menstrual period, and the same greater liability probably obtains *at* the period did not the flow prevent cohabitation; moreover, the union of the germ-cell with the spermatic fluid of the male may take place *at* the ovulatory period from the survival of spermatozoa introduced by coitus a week or more before ovulation; the ovule also may remain after being discharged from the ovary and be impregnated a week or more after menstruation.) *Third.* It is stated that ovules are discharged from the ovary without any accompanying menstrual flow. (Answer. This may be admitted and explained without fatally conflicting with the

[1] Small supernumerary ovaries have been found twenty-three times in five hundred bodies. (Garrigues, quoting Beigel.)

theory. It is, however, exceptional.) While some recent writers regard the ovulatory theory of menstruation as a thing of the past—of only historic interest—it cannot be thus summarily disposed of at present. True, those who have had large experience in removing the ovaries and Fallopian tubes find perhaps "hundreds of cases" (an *apparently* convincing expression) in which menstruation continued after this mutilation, but *all* these women were so far *abnormal* as to require surgical interference. There are "hundreds of millions" of *normal* women in whom we have every reason to believe the functions of ovulation and menstruation are as intimately related as they were thought to be before the days of modern abdominal surgery.

On the whole, the ovulatory theory of menstruation is the best yet propounded, and must be received, at least for the present.

Changes in the Uterine Mucous Membrane at the Menstrual Epochs.—Just before the flow the membrane becomes much thicker, congested, and thrown into shallow folds. Then it undergoes disintegration by fatty degeneration, and is thrown off with the blood that flows from the opened capillary bloodvessels. There exists some discrepancy of opinion as to *how much* of the mucous membrane is thrown off every month, but no doubt exists as to the fact of its becoming physiologically hypertrophied just before the menses, and of its undergoing a certain degree of fatty atrophy and degeneration during and immediately after the period. Shortly after menstruation a new mucous membrane is already in course of preparation.

Some writers affirm that the ovule discharged at a given menstrual period does not really belong to that period, but to the next subsequent one, that is to say: the menstrual process (decidual degeneration) occurring, *ex. gr.*, at the middle of February, is the breaking up of the decidual membranes prepared for the ovule set free a month before, at the middle of January. This theory, indorsed by high authority, is probably correct, although considered untenable in the last edition of this book.

What becomes of the Ovule?—When not impregnated it is lost and discharged with the menstrual flow, either before

or after its disintegration. It is too small to be seen, the vitelline membrane is a mere cell, $\frac{1}{1200}$ of an inch in diameter, and its contained germinal vesicle measures $\frac{1}{720}$ of an inch; the germinal spot about $\frac{1}{3000}$. The "vesicle" is the nucleus of the cell; the "spot" the nucleolus; the entire egg simply a mass of protoplasm.

The First Menses and Puberty.—*Menstruation* begins at about fourteen or fifteen years of age—the "*age of puberty*," so called. This period is preceded and attended by what are called the *signs of puberty*. They consist in the development of womanly beauties, physiologically designed to attract the male; enlargement and growth of hair upon the mons veneris and labia majora; growth of hair in the axillæ; enlargement and increased rotundity of the hips and breast; the vulva is drawn downward and backward, so that in the erect posture no part of it is visible anteriorly, as it is in children; striking changes also occur in the inclinations and emotional susceptibilities of the woman.

Circumstances modify the age at which the first menstruation takes place: thus, the menses appear earlier in *hot climates*, but the difference between the hottest and coldest climates is only about three years; the influence of *race*, which remains potent in spite of climatic changes; *occupation and mode of life:* luxury, stimulants, indolence, hot rooms, pruriency of thought, etc., render the woman precocious, while opposite conditions retard the menses; general robustness of constitution and vigorous health promote the development of menstruation, and it is delayed by feebleness and debility. On the other hand, a very tall woman with large bones and muscles will require more time to complete her growth, and hence the reproductive functions will be belated.

The very rare and unique cases, indisputably authenticated, in which children one or two years old have presented the external anatomical evidences of puberty, and have then menstruated with more or less regularity, and have even become mothers before they were ten years old, are mere medical curiosities—*lusus naturæ*—of but little import in discussing the physiology of this subject.

Symptoms of Menstruation, not always present, are lassitude and depression of spirits, headache, backache, chilliness,

weight in hypogastrium and perineum, nausea, neuralgia, hysteria, perhaps slight febrile excitement. They vary in kind and degree in different individuals, and are generally relieved by the flow. The first few periods are apt to be irregular in their recurrence, and the discharge is slight in quantity and composed of mucus with but little blood.

Quantity and Qualities of the Menstrual Discharge.—The *quantity* of discharge, when the function has become regularly "established," is from one to eight ounces, the average being about five ounces. The duration of the period is from one to eight days, the average being five days, hence average daily quantity during that period, one ounce.

The menstrual blood does not coagulate, owing to admixture with vaginal mucus, which contains acetic acid. If the flow be very profuse, coagulation will occur, because the action of the vaginal mucus is then insufficient to prevent it. Mucus of *any* kind, in sufficient quantity, will prevent coagulation.

The discharge also differs at different parts of the period. Toward the beginning and end of the epoch it contains more mucus and less blood; at the middle of the period *vice versa.*

Source of the Flow.—That the flow comes from the uterine cavity is absolutely proved by the following facts: it is found there, *post mortem*, in those who die during menstruation; it is seen to issue from the os externum uteri in cases of procidentia of the organ; it has been seen oozing from the uterine mucous membrane in cases of inversion of the womb; and when there is mechanical obstruction of the os uteri the menses do not appear, but accumulate and distend the uterine cavity.

Vicarious Menstruation.—This is a flow of blood from some other organ recurring at the monthly periods and taking the place of menstruation. It may occur from the hemorrhoidal vessels, the lungs, the skin, the nails, the mammary glands, ulcerated surfaces, and many other parts.

Periodicity.—The monthly recurrence of menstruation is accounted for only in so far as ovulation explains it. The interval sometimes varies from the typical twenty-eight days, but it is, then, strangely, some multiple of a week.

Normal Suspension of Menstruation.—It is temporarily suspended during pregnancy and lactation, and ceases permanently after the so-called "change of life," at about forty-five or fifty years of age. Numerous exceptions must be noted to each of these statements.

CHAPTER VI.

MATURATION, FECUNDATION, AND NUTRITION OF THE OVUM.

Maturation of the Ovule.—The ovaries of a new-born child already contain the *im*mature ovules that later in life, and after becoming mature, will be discharged at the menstrual periods or become impregnated. The ovule discharged from the ovary by a woman of eighteen is therefore, in reality, about eighteen years old at the time it escapes from the ovisac. During all this time the ovules have been actual living beings, leading a low form of life something like the amœba of the outside world. Like the amœba, the ovule floats in a fluid—the liquor folliculi; it possesses amœboid movement, carries on a slow nutrition, and probably competes with its neighbors in the struggle for existence. After puberty, at stated periods of about a month, one of these undeveloped and immature ovules enters upon a somewhat more active and exalted plane of life; it becomes mature and ready for fecundation, and is then discharged from the ovarian stroma, as explained in Chapter IV. page 67.

The changes that take place in it before and independent of fecundation are as follows: the germinal vesicle, instead of remaining near the centre of the egg, floats toward and touches the vitelline membrane, and then, elongating itself into two poles, projects one of these poles through the vitelline membrane into the peri-vitelline space; the *polar globule* thus extruded is constricted off and completely separated from the germinal vesicle. This process is once more repeated, and a second polar globule is extruded, constricted off, and separated. After discharging these two polar globules (which were really portions of itself), what remains of the germinal

vesicle recedes back again to a more central position in the egg, and this remaining portion is now called the "*female pronucleus.*" The egg is now ready for fecundation. The discharge of the polar globules and the preparation of the female pronucleus for fecundation may take place either before or after the discharge of the ovule from the ovary. It has been suggested that the discharge of the polar globules is designed to make room for the entrance of the male element or sperm-cell, and also that it prevents parthenognesis, which may or may not be true.

FECUNDATION OR IMPREGNATION is the union of the germ-cell (ovule) with the sperm-cell of the male.

The *spermatic fluid* (sperm, semen, seminal fluid) is a whitish, viscid fluid secreted by the genital glands of the male. Floating about in it are millions of histological elements resembling ciliated epithelium cells, called *spermatozoa* (spermatozoids). By waving of its long cilium the spermatozoid moves about, at a rate, it is estimated, of one inch in seven and a half minutes—a faculty which it may retain for eight or ten days after being introduced into the female genital organs, and upon which the fecundating power of the semen chiefly depends. They have been found alive in executed men three days after death. They are destroyed by acid solutions, and are enlivened by alkaline ones; thus the alkaline mucus of the uterus is favorable to their activity, while the acid vaginal secretion is destructive. When brought in contact with the germ-cell the spermatozoa get into the ovule by penetrating the vitelline membrane. This union may take place either in the ovary, Fallopian tube, or uterus. Recent investigators affirm that only *one* spermatozoid is concerned in a normal impregnation. Several of them may penetrate the zona pellucida and get into the peri-vitelline space, but only one enters through the internal vitelline membrane into the vitellus. When a spermatozoid in the peri-vitelline space approaches the yolk a little projecting elevation of the internal vitelline membrane is thrown out toward it, which the spermatozoid may penetrate; or, before this penetration, the projecting elevation is withdrawn, leaving a slight hollow or depression, into which the spermatozoid enters head first; and the head having entered, the locomotive tail and central part of the spermatozoid are left outside in the peri-vitelline space. The

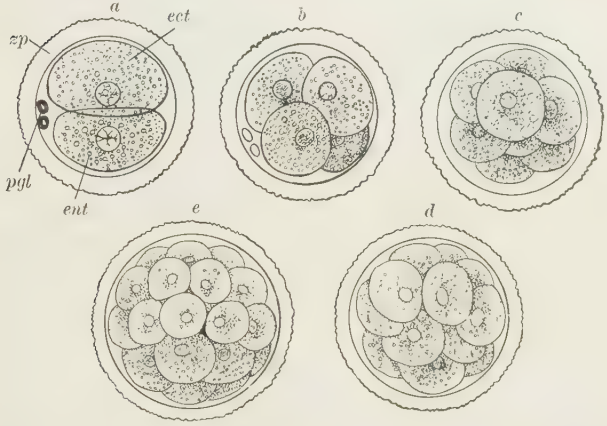
head of the sperm-cell, now inside the ovule, is called the "*male pronucleus.*" It is interesting to observe that as the germinal vesicle *discharged* its polar globules into the peri-vitelline space in order to become a "female pronucleus" ready to receive the male element, so the sperm-cell *leaves behind* in the same peri-vitelline space the tail and central portion of its structure, in order to become a "*male pronucleus*" ready for union with the female. The male and female pronuclei inside the vitellus approach each other, travel toward the centre of the egg, remain in contact for a time, and finally fuse together: fecundation is then complete. The whole ovum, after this union of the male and female pronuclei, is called the "*Oosperm*" (ωον, an egg; σπερμα, seed). The natural receptacle for the semen (receptaculum seminis), in the act of coition, is the cavity of the uterus, whither it is conducted by the five or six successive ejaculatory jets on the part of the male organ, and the five or six suctional aspirations on the part of the os and cervix uteri that occur when the orgasm is complete in both sexes simultaneously. It afterward goes on through the Fallopian tube to the ovary; though it is not at all improbable that the tubes also become the recipients of semen during the sexual orgasm, or during the few hours embracing several successive sexual acts. Hence theoretical speculations based upon the alleged fact that it requires eight days for the ovule to pass along the tube to the uterus *before it can become impregnated* cannot be sustained. Tubal pregnancies directly negative this supposition.

Changes taking place in the Ovum after Fecundation.—At first the fecundated egg is simply a cell. Its cell wall is the vitelline membrane; its contents are the granular vitellus (or yolk) and a nucleus, which last, we have seen, is now a somewhat complex structure, being composed of the male and female pronuclei, together with that part of the germinal vesicle which remained after the separation from it of the polar globules. The next change is *segmentation* of the vitellus—not of the vitelline *membrane*, but of the vitellus within it. The nucleus first divides, then the cell. The two cells thus formed divide in a similar manner, and four are produced. The four divide into eight, the eight into sixteen, and this dichotomous subdivision continues until a great num-

ber of cells are produced. The cells thus formed arrange themselves in a special manner, now to be described.

The two cells resulting from the first segmentation differ in *size* and *appearance*, as well as in their inherited endowments and future destiny; and so do the two groups of cells resulting from their further subdivision. The larger cells are called "*epiblastic cells*" ("epiblastic spheres" or "ectomeres"): the smaller ones "*hypoblastic cells*" (or "*hypoblastic spheres*," or "entomeres"). The relative arrangement of these two groups of cells during their earlier subdivisions is well seen in Fig. 22.

FIG. 22.

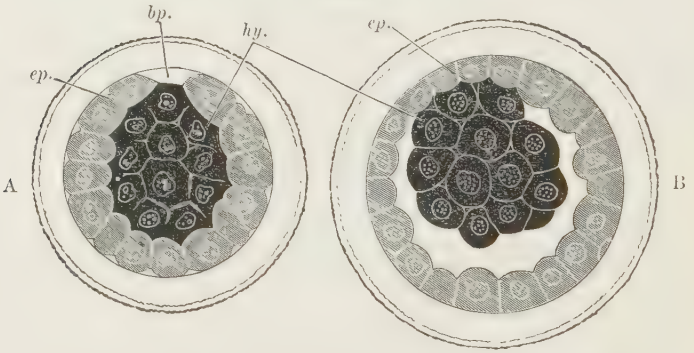


First five stages of segmentation (rabbit's ovum)—*a*, *b*, *c*, *d*, and *e*. In *a*, *b*, and *c* the epiblast cells are larger than the hypoblastic ones. In *e* the epiblast cells have become smaller and more numerous than the hypoblasts, and the epiblastic spheres are beginning to surround and close in the hypoblast cells. *zp*. Zona pellucida. *pgl*. Polar globules. *ect*. First epiblast cell. *ent*. First hypoblast cell.

A little later the hypoblast cells collect as an irregular central mass, while the epiblast cells are disposed around them, so as to cover them up and surround them, except at one point, which is called the blastopore (see A, Fig. 23). This blastopore soon closes, and then the hypoblastic mass is *entirely* closed in and surrounded by epiblastic cells (Fig. 23, B). Between hypoblast and epiblast a little fluid begins to accumulate, as shown in B, Fig. 23. This fluid increases, and

begins to separate the hyplobastic cells from the epiblastic ones except at the site of the former (but now obliterated) blastopore. The space between the two sets of cells is soon rapidly enlarged by this accumulating fluid, and the whole ovum becomes distended into a vesicle—now called the *blastodermic vesicle*. The larger part of the wall of this distended

FIG. 23.



Two further stages following segmentation (rabbit's ovum). *ep.* Epiblast. *hy.* Hypoblast. *bp.* Opening in epiblast (blastopore) not yet closed. In B this opening *has* closed.

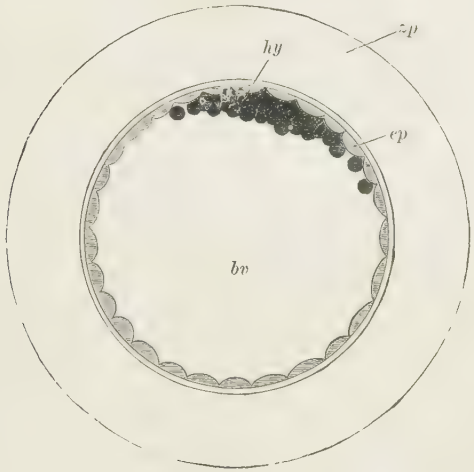
vesicle is composed only of epiblastic cells, while a smaller part of it is composed of the same epiblastic cells, together with the mass of hypoblastic cells which have been pressed against the epiblast by the accumulating fluid within. (See Fig. 24, page 81.)

The blastodermic vesicle continues to enlarge; the hypoblastic mass of cells, at first lens-shaped, is flattened still more and spread out over the inner aspect of the epiblast, but its central portion remains thicker than its peripheral margin, and this thicker part is the commencement of the "*embryonic area.*" Let it be especially noted here that at first the embryonic area only lines a *part* of the inner surface of the epiblast (Fig. 24), hence the remaining portion of the blastodermic vesicle (and composed *only* of epiblast cells) must be known as the *non-embryonic* part of the epiblast. Viewed in a profile section, the embryonic area might be compared to the

crescent of a new moon, while the rest of the lunar globe would be represented by the non-embryonic portion of the blastodermic sphere.

The embryonic area, composed of hypoblast cells and covered with epiblast, now separates into two layers—two rows or plates of cells—one external to the other, the external one

FIG. 24.

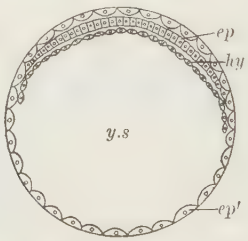


zp. Zona pellucida. *ep.* Epiblast. *hy.* Hypoblast. *bv.* Cavity of blastodermic vesicle.

having the epiblastic layer outside of it. Now an event occurs that complicates this description and involves some rather confusing terms, viz., that portion of the epiblast in contact with and covering the outer surface of the embryonic area gradually gets thinner and eventually disappears, so that the external layer of the hypoblast *itself* becomes the outer surface of the embryonic area, and is henceforth to be called "*epiblast.*" The former epiblast layer that disappears may be remembered as the "*primitive*" epiblast, the non-embryonic portion of which is continued over the remainder of the blastodermic vesicle, and, while it helps to form the amnion and umbilical vesicle, has nothing to do with the actual formation of the embryo itself. Thus far, then, the body of the

future fœtus consists of two layers of cells, produced by splitting of the original hypoblast into an outer and an inner layer —the outer one to be called "*epiblast*," the inner one "*hypoblast*." A profile section of the ovum at this stage is represented diagrammatically in Fig. 25, in which, however, the primitive epiblast cells (covering the outer layer of the hypoblast) have not yet disappeared.

Fig. 25.



Mammalian Blastodermic Vesicle.

ep'. Non-embryonic epiblast extending all around the ovum, but which will disappear later over the embryonic area, when the outer layer of the hypoblast will become the embryonic epiblast, *ep*. *hy*. Hypoblast. *y.s*. Yelk sac.

Later on a *third* layer of cells develops between the embryonic epiblast and the hypoblast: this is the *mesoblast*, or mesoderm. These three layers of cells—*epiblastic*, *mesoblastic*, and *hypoblastic*—soon form three membranes, from which all parts of the future fœtus are to be developed. Exactly what organs are evolved from each of these membranes is as yet unsettled, but recent investigation would seem to warrant the following arrangement:

The *epiblast* (or ectoderm) (external blastodermic membrane) forms the epidermis and its appendages (hair and nails), its glands, including the mammary glands; the nervous system (brain, spinal cord, ganglia, and nerves), and the organs of special sense.

The *mesoblast* (mesoderm, or middle blastodermic membrane) forms the muscles and skeleton (bones, cartilages, ligaments, connective tissues); the heart, bloodvessels, blood glands, and spleen; the lymphatics; the genito-urinary and reproductive organs.

The *hypoblast* (entoderm, or internal blastodermic mem-

brane) forms the epithelial lining of the digestive canal and of its glands, and the epithelial lining of the lungs and air-passages.

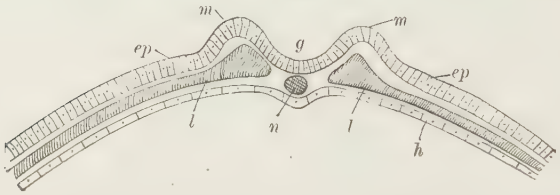
In now studying the development of the ovum it must first be understood that all the changes to be related take place *inside the vitelline membrane*, which, though extremely thin, delicate, and soft, really plays the part of a sort of eggshell, inasmuch as it contains all the other structures of the embryo with which we have to deal. Moreover, the vitelline membrane does not break until the end of pregnancy, though, as we shall see, it becomes lost by extreme attenuation and by amalgamation with other membranes lining its inner surface.

If we now suppose ourselves to look down upon the outside surface of the epiblast (either looking *through* the vitelline membrane or supposing it to be removed for this inspection), we observe a central part of the embryonic area to be more transparent than the rest: it is called the "*area pellucida*." Immediately around this is a more opaque border, the *area opaca*. The first visible trace of the body of the embryo appears in the *area pellucida:* a line of cells near its centre becomes darker and constitutes the "*primitive streak*," which was formerly thought to be the beginning of the spinal canal or spinal column. This is not so. While the direction of the primitive streak agrees with the long axis of the future embryo, the embryo itself develops in front of the primitive streak, which last is temporary, and soon disappears. The "*streak*" is thought to be the remnant of some ancestral form which existed before the evolution of vertebrate organisms.

The establishment of a spinal column, spinal canal, and central nervous system does indeed appear to constitute the earliest beginning of the organization of the body of the embryo, but this occurs independent of the "primitive streak." In the formation of these structures the *epiblast* and *mesoblast* simultaneously contribute in the following manner. The mesoblast cells separate from the hypoblast and mass themselves together to form a distinct rod in line with the future backbone of the embryo. This rod is the "*notochord*." From it the spinal column is developed. At the same time the epiblast becomes thickened (by multiplication of its cells) into two longitudinal ridges or folds running parallel with the notochord (one on each side of it) and

continuing around that end of the notochord where the head of the fœtus is to form. The epiblastic ridges are called "*medullary folds*" and the trough between them the "*medullary groove.*" This groove ends *anteriorly* by the *headfold*,

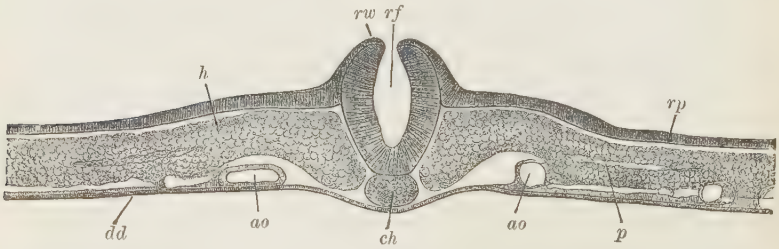
FIG. 26.



Cross-section of embryo in the dorsal region, showing beginning of medullary folds and groove. *m, m.* Medullary folds. *g.* Medullary groove. *ep.* Epiblast. *n.* Notochord. *h.* Hypoblast. *l, l.* Peripheral plates of mesoblast.

and, later, it ends *posteriorly* by the *tailfold*. Finally these rising folds on the sides and ends of the medullary groove arch over, meet, and join, thus converting the groove into a canal—the "*neural canal*" or medullary tube—which is thus

FIG. 27.

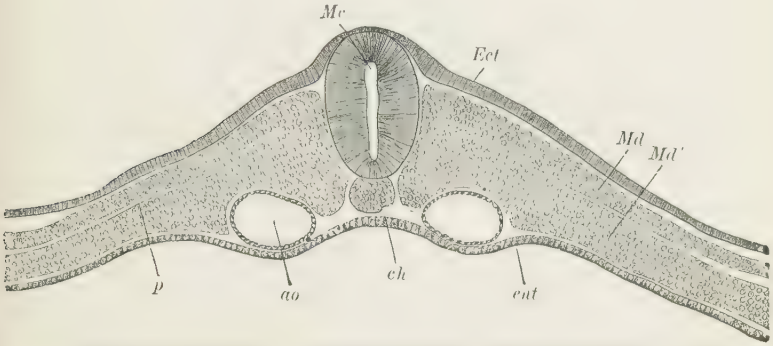


Cross-section some hours later than in Fig. 26. *rw.* Medullary folds. *rf.* Medullary groove closing in. *rp.* Epiblast. *h.* Peripheral plates of mesoblast. *ch.* Notochord. *dd.* Hypoblast. *ao.* Aortic arch. *p.* Commencing slit in mesoblast separating it into somatopleuric and splanchnopleuric layers (these last to be spoken of further on).

lined with involuted epiblast, and which remains throughout life as the central canal of the spinal cord and as the third, fourth, and lateral ventricles of the brain and the passages uniting them.

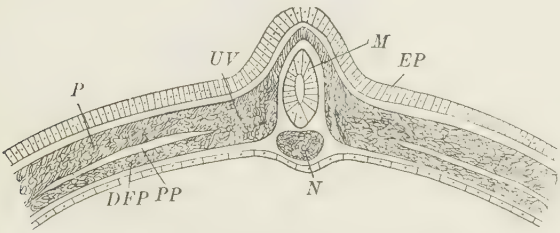
The several stages in the formation of the medullary folds, groove, and canal are shown diagrammatically in Figs. 26, 27, 28, and 29, representing cross-sections of the embryo.

FIG. 28.



Cross-section of embryo in cervical region, showing closure of medullary groove. *Mc.* Neural canal. *Ect.* Epiblast. *Md.* Part of mesoblast which will unite with epiblast to form the somatopleure. *Md'.* Part of mesoblast which will become the splanchnopleure. *ch.* Notochord. *p.* Commencing pleuro-peritoneal cavity. *ent.* Hypoblast. *ao.* Aortic arches.

FIG. 29.

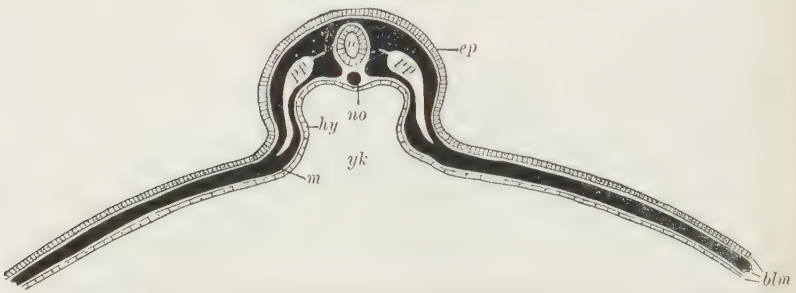


Cross-section of embryo in dorsal region, showing extension of mesoblast between epidermal epiblast and involuted portion of epiblast lining neural canal. *EP.* Epidermal epiblast. *M.* Epiblast lining neural canal. *UV.* Undivided part of mesoblast. *P.* Mesoblastic layer forming body wall (somatopleure). *DFP.* Mesoblastic layer forming intestinal walls (splanchnopleure). *N.* Notochord. *PP.* Commencing pleuro-peritoneal cavity.

Soon after the formation of the medullary folds, with their terminal head- and tail-folds, as just described, there begin to appear "*lateral folds*" (formerly called "*abdominal plates*").

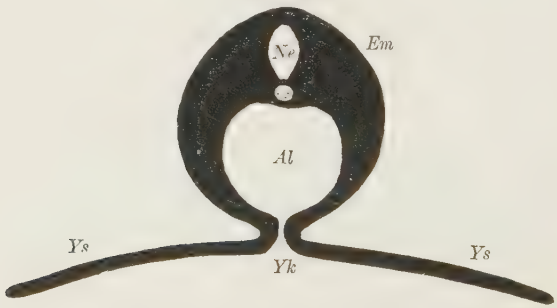
These will eventually close in the abdominal or body cavity, just as the medullary folds closed in the cavity of the neural canal. The side-folds are continuous with the head- and tail-

FIG. 30.



Cross-section of embryo, showing origin of side-folds. *ep.* Epiblast. *n.* Neural canal. *hy.* Hypoblast. *m.* Mesoblast. *no.* Notochord. *blm.* Extension of three layers (epiblast, mesoblast, and hypoblast) over non-embryonic part of blastodermic vesicle and covering yelk-sac. *pp.* Pleuro-peritoneal cavity. *yk.* Yelk.

FIG. 31.



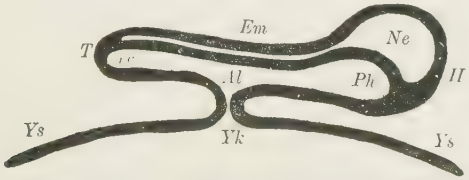
Diagrammatic cross-section to show meeting of side-folds. *Em.* Embryo. *Ne.* Neural canal. *Al.* Enclosed smaller part of blastodermic vesicle to form abdominal cavity and alimentary canal. *Ys.* Unenclosed larger part of blastodermic vesicle—the yelk-sac or umbilical vesicle, *Yk.* Food yelk. In this diagram the mesoblast only is shown; epiblast and hypoblast are omitted.

folds, but they project in an opposite direction to that taken by the medullary folds (as shown in Fig. 30), *i. e.*, the medullary folds begin by projecting *backward* and meet in the median line of the *back* of the fœtus, while the lateral folds

begin by projecting *forward* and meet in the median line of the *abdomen.*

In Fig. 30 it will be seen the three layers (epiblast, mesoblast, and hypoblast) have extended over the entire blastodermic vesicle, but near the point *m*, on each side, the *lateral folds* are beginning to approach each other, and will eventually meet so as to enclose and shut off a small part of the vesicle from a much larger part, as shown in Fig. 31. The enclosed portion will become the abdominal cavity and alimentary canal; the hypoblast forming the epithelial lining of that canal; the mesoblast (its inner layer or splanchnopleure) forming its muscular walls; the outer layer of the mesoblast, or somatopleure, forming the muscular walls of the abdomen; while the epiblast will form the epidermis of the abdominal wall. The larger *un*enclosed portion remaining outside is called the *umbilical vesicle* or yelk-sac.

FIG. 32.



Longitudinal section (diagrammatic) to show meeting of side-folds closing in abdominal cavity. *Em.* Back of embryo. *Ne.* Neural canal. *H.* Head-fold. *T.* Tail-fold. *Al.* Alimentary canal almost closed in. *Ys.* Yelk-sac or umbilical vesicle. *Yk.* Yelk-food. *Ph.* Embryonic pharynx. *re.* Embryonic rectum. (The three layers of the blastoderm are not shown.)

A diagrammatic *longitudinal* section of the embryo at this time is shown in Fig. 32.

For some time the cavity of the alimentary canal communicates with the larger cavity of the yelk-sac, but the latter gradually dwindles in size as its contents are absorbed into the body of the fœtus. The channel of intercommunication becomes elongated into a slender duct (the "vitelline duct"), and finally the remains of the yelk-sac consist only of a very diminutive vesicle attached to the end of a string-like stalk —the now obliterated vitelline duct. This stalk and vesicle may be found in the navel string after birth, by careful dissection.

Returning for a moment to Fig. 30 (see also Figs. 27, 28, and 29), it will be observed that the *mesoblastic* layer of the side-folds splits in *two layers*, a cleft between them being the commencement of the pleuro-peritoneal cavity.[1] The *outer* one of these two layers of mesoblast unites with the epiblast to form the lateral and ventral walls of the trunk (muscles, ribs, etc.). The combined epiblast and outer layer of mesoblast is the "*somatopleure.*" The *inner* layer of the mesoblast joins the hypoblast to form the "*splanchnopleure,*" which gives rise to the walls of the alimentary canal (muscular coat, glands, epithelial lining, etc.). The space between the two layers of mesoblast is known as the "*mesoblastic cleft;*" and later on is called *cœlom*, or "*body-cavity,*" and becomes finally the pleuro-peritoneal cavity.

It would be beyond the scope of this work to describe the development of the various organs of the embryo; the structures concerned in the nutrition of the fœtus while *in utero*—most of them being temporary affairs—will, however, require consideration.

As we have seen, the earlier source of nutriment out of which the body of the fœtus begins to be built up is the food-yelk in the cavity of the yelk-sac or umbilical vesicle; the channel of communication by which this nutrient material is carried to the fœtus is provided by bloodvessels. On the surface of the umbilical vesicle may soon[2] be seen an artery, vein, and intermediate capillaries—the *omphalo-mesenteric* artery and vein—the existence of which presupposes that a rudimentary heart and vascular system have already formed from the mesoblast, for these omphalo-mesenteric vessels are continuous with those inside the abdomen which eventually constitute the portal system of vessels. It should here be noted that the bloodvessels of the *umbilical vesicle* are quite distinct from those of the *umbilical cord*, which last are formed in a different manner, from the root of the *allantois*, as described further on. The contents of the umbilical vesicle will soon become exhausted and the vesicle shrink almost to nothing. Some other source of nutrition for the embryo must therefore be supplied. This is provided for by the devel-

[1] In the early development of the embryo the pleural and peritoneal cavities are one: the diaphragm separating them forms later.

[2] After twenty-four hours' incubation of the hen's egg a rudimentary heart and vascular trunks may already be demonstrated.

opment, successively, of the *amnion*, *allantois*, *chorion*, and placenta, which indeed has already begun before the contents of the umbilical vesicle have disappeared.

Let it not be overlooked that the hypoblastic lining of the umbilical vesicle is continuous with the hypoblastic lining of the rudimentary intestine, and the bloodvessels of these two are also continuous, and perform alike the *function of absorbing nutrient material*, just as the fully developed intestine of an adult absorbs chyle.

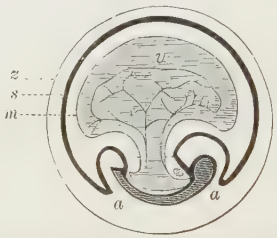
Now it will be seen that the succeeding device by which the embryo is nourished, after the shrinking away of the umbilical vesicle, is again an organ or structure whose inner lining and bloodvessels are continuous with those of the alimentary canal, and by which the function of absorbing nutriment is again provided for. This organ begins with the formation of the *allantois*, which is to surround the fœtus and to come in contact, externally, with the mucous membrane of the uterine cavity, so that the fœtus becomes entirely surrounded by and enclosed in a globular sac—a vascular bag—the outside of which is in contact with the uterine wall, and which is itself a structure continuous with the infant's intestine. To understand how this puzzling arrangement can occur we must first consider the formation of the *amnion*.

THE AMNION, ALLANTOIS, AND CHORION.—The arrangement and development of these structures will be best shown by supposing a section of the ovum to be made in a longitudinal direction—*i. e.*, parallel with the spinal column. (See Figs. 33, 34, 35, and 36.)

The first structure to be observed is the *amnion:* it begins by the rising up all around the embryo (behind, in front, and on its sides) of a hollow ridge, fold, or duplication of the epiblast and upper layer of the mesoblast (somatopleure); these hollow ridges continue to grow upward, arch over the dorsal aspect of the fœtus, and finally meet and unite. Where the two meeting folds touch each other, the double septum so formed breaks down and melts away along its centre, while the contiguous *edges* of the two meeting folds join each other (see Fig. 35); thus a free space is made between the hollow cavities of the two approaching folds, while the union of the two inner layers has formed the *inner* or *true amnion*, and that of the two outer layers the *external* or *false amnion*, which thus

separate from each other. The external peripheral surface of the *outer* amniotic layer (*false amnion*) comes in contact with the vitelline membrane, and these two amalgamate or weld together to form a single membrane ("subzonal membrane"),

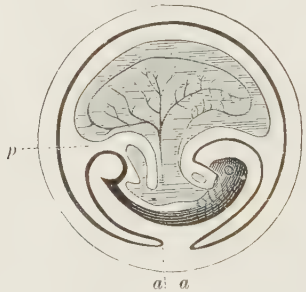
FIG. 33.



a, a. Projecting double folds of amnion composed of epiblast and somatopleure of mesoblast. *z.* Zona pellucida, or vitelline membrane. *s.* Epiblast. *m.* Hypoblast lining umbilical vesicle and continuous with lining of intestine. *U.* Umbilical vesicle.

while the *internal* layer of the amnion (*true amnion*) becomes distended with fluid (*liquor amnii*), and, growing larger and larger during pregnancy, fills the womb, and constitutes one of the membranous strata composing the "bag of waters" that bursts during labor.

FIG. 34.

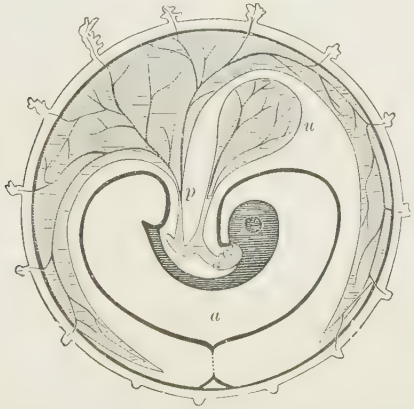


Development still more advanced. *a, a.* Folds of amnion about to touch and join each other. *p.* Commencement of allantois.

THE ALLANTOIS AND CHORION.—The allantois begins as a membranous vascular pouch springing from and continuous

with the lower part of the intestinal mucous membrane. (See Fig. 34, page 90.) It follows inside the space of the hollow amniotic pouch, and, like it, widens, spreads laterally, and eventually its two progressively extending margins meet and join each other, so that the fœtal body is now enclosed completely in a layer of *allantois*, which, from the nature of its place of origin, is, of course, situated between the internal and external layers of the amnion. That part of the root or neck of this allantoic membranous sac which remains *outside* of the abdominal wall becomes, and in fact already *is*, in a rudimentary form, the umbilical cord or navel string; while that portion of the allantois enclosed *within* the abdominal cavity becomes, later on, the urinary bladder and urachus. The canal of the urachus becomes eventually obliterated, and thus a ligamentous cord remains, constituting the middle ligament of the bladder of adult life.

FIG. 35.



Showing junction of amniotic folds at *a*. *u*. Umbilical vesicle. *p*. Pedicle of allantois. The projecting folds of the allantois, passing round the embryo, and following the folds of the amnion, will soon join and unite, completely surrounding the ovum.

The larger part of the allantois—the part outside of the abdominal plates—has its cavity obliterated early in fœtal life by the disappearance of its contents, and by its two opposing folds or walls adhering and uniting along their in-

ternal surfaces to form one layer, which comes in contact with the inner concave surface of the external amnion and amalgamates with it. Thus the external amnion has the vitelline membrane on the outside of it and the allantois on the inside. The three amalgamated together, as they now are, compose a single membrane, which receives henceforth the name of "*chorion.*"

FIG. 36



Showing folds of allantois completely united, and their two layers in contact with epiblast and vitelline membrane, to form chorion with its villi. 1. Vitelline membrane. 2. Epiblast. 3. Allantois. 4. Umbilical vesicle. 5. Amnion (its internal layer, containing liquor amnii). 6. Body of fœtus. 7. Pedicle of allantois, to become the umbilical cord.

The chorion afterward becomes covered externally with projecting villi, not unlike those of the adult small intestine, each of which, later on, receives a capillary vascular loop derived from what were originally the vessels of the allantois. The *villi* of the chorion, covered with epithelium externally, and containing the bloodvessels in their central axes, grow longer and branch out at their distal extremities, this process being more complete and complicated in that part of the chorion which is to participate in forming the future placenta.

The projecting, dangling villi of the chorion (often termed its "shaggy coat") give the ovum, when examined post mortem, the appearance of a little bunch of wet, whitish, gelatin-

ous moss. After eight weeks the villi over a greater part of the chorion disappear—this part is said to become *bald*—while about one third of the surface retains its villi, and the latter become developed more and more, to form, as we shall see presently, the placenta.

FIG. 37.

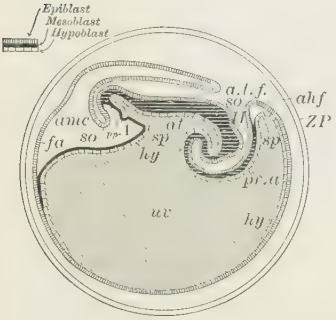


FIG. 38.

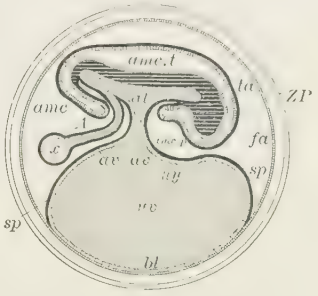


FIG. 37. *H.* Head of embryo. *pp.* Tail portion of pleuro-peritoneal cavity. *amc.* Tail portion of primitive amniotic cavity (the *primitive* amniotic cavity is the hollow space inside the double folds that rise over the back of the fœtus). *a.l.f.* Tail fold of amnion. *ahf.* Head fold of amnion. *so.* Somatopleure. *sp.* Splanchnopleure. *fa.* False amnion. *hy.* Hypoblast. *at.* Alimentary canal, communicating with cavity of *uv*, the umbilical vesicle. *ZP.* Zona pellucida. *A.* Commencing projection of allantois.

FIG. 38. The amniotic folds have united, inclosing *amc.t*, the true amniotic cavity. *fa.* False amnion, whose cavity, *amc*, *amc.p*, is continuous with pleuro-peritoneal cavity. *at.* Alimentary canal, still communicating with *uv*, the umbilical vesicle. *A.* Stem of allantois dilating into a vesicle at *x*. *hy.* Hypoblast. *sp.* Splanchnopleure, composed of mesoblast and hypoblast, and continuous with splanchnopleure of intestine. *ZP.* Zona pellucida.

Since the amnion, as thus far explained, seems only to envelop the dorsal aspect of the fœtus, some further explanation is necessary in order to understand how the *whole body* of the child eventually floats (as it were, tethered by its navel string) in an amniotic bag that *completely* surrounds it. This explanation is as follows: The elastic amnion becomes more and more distended with fluid (the liquor amnii), and the two ends of the sac, yielding to this distention, gradually swell toward each other, as if rolled along the anterior surface of the fœtal body, until they meet on the abdomen, with nothing but the umbilical cord and the remains of the umbilical vesicle be-

tween them. The wide, rounded ends of the amnion that thus meet over the abdomen are *continuous with the integument of the fœtus*, and after contributing a sheath to the umbilical cord, as just stated, go on to join the reflected layer already described as covering the dorsal aspect of the fœtus.

Fig. 39.

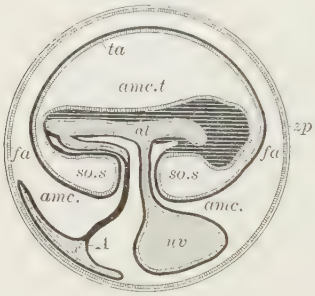


Fig. 40.

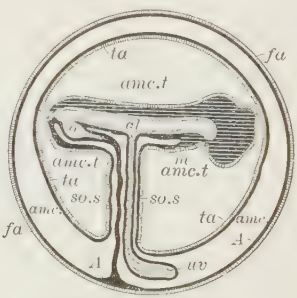


Fig. 39. *ta.* True amnion, its cavity, *amc.t*, beginning to extend with liquor amnii. *fa.* False amnion, its cavity, *amc*, continuous with pleuro-peritoneal cavity. *so.s.* Folds of true amnion bulging over abdomen and beginning to form sheath over stems of umbilical vesicle and allantois. *uv.* Umbilical vesicle. *zp.* Zona pellucida. *A.* Allantois; its stem is hollow and continuous with cavity of alimentary canal; at *x* it is dilating into a vesicle lined with hypoblast.

Fig. 40. *A.* Allantois, its cavity now obliterated, it has spread all around, and joined subzonal membrane (composed of false amnion and vitelline membrane), to form chorion. *uv.* Remnant of umbilical vesicle. *at.* Alimentary canal. *o.* Dilated root of allantois within abdomen, to form urinary bladder and urachus. *m.* Commencing enfolding to join cavity of alimentary canal, and form mouth and buccal cavity: a similar notch at the caudal end of the embryo indicates site of future anal opening. *so.s.* Folds of true amnion forming sheath of navel string, and inclosing root of allantois and stem of umbilical vesicle. (The other letters have same reference as in Fig. 39.)

To recapitulate the several structures with which the fœtus is surrounded, as thus far described, and proceeding *from within outward*, they are as follows:

1. The *amnion—i. e.*, the *inner layer* of the amnion, containing the liquor amnii, in which the fœtus floats.
2. The *allantois.*
3. The *external layer of the amnion.*
4. The *vitelline membrane.*
5. The three last-named membranes weld together to form the *chorion.*

The formation of the amnion, allantois, and chorion; the gradual shrinking of the umbilical vesicle, together with the way in which the true amnion and its contents eventually fill the uterine cavity, and in which the umbilical cord and the remains of the umbilical vesicle become covered with a sheath of amnion, may be rendered more easily intelligible by reference to Figs. 37, 38, 39, and 40 (from *Hirst's System of Obstetrics*).

Changes in Uterine Mucous Membrane. Formation of Decidua, etc.—While the changes thus far described have been going on in the ovum, others have also taken place in the uterus, especially in the *uterine mucous membrane*.

Fig. 41.



Formation of decidua vera, which is represented by black coloring.

Fig. 42.



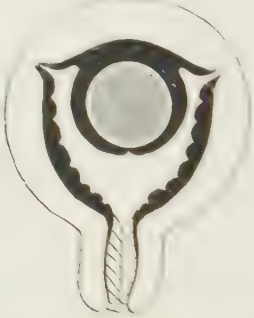
Formation of folds of decidua reflexa growing up around ovum.

The increased vascularity, hypertrophic thickening, and shallow folding of the uterine mucous membrane, which, we have seen, begin, preparatory to ovulation, at each menstrual period, progress, after the stimulus of impregnation, with rapidity. The membrane becomes extremely thick, vascular, and deeply convoluted (except near the orifices of the Fallopian tubes and os internum), so as to obliterate, or almost *fill*, the cavity of the womb. The hypertrophied mucous membrane thus formed on all sides of the uterine cavity is called the *decidua vera*.

When the ovum first enters the womb it lodges between two of the folds of the decidua vera, and, imparting an extra

stimulus to those portions of this membrane immediately surrounding it, they grow up all around the ovum, and, being reflected over it, meet and join together, thus, as it were, burying the little germ in a circular grave of mucous membrane, the

FIG. 43.



Joining of folds of decidua reflexa around ovum, and thickening of decidua serotina where the placenta will develop.

arched covering of which is the [illegible]. That part of the decidua vera which lies [illegible] the ovum and the uterine wall, the [illegible] of our imaginary grave, is the [illegible]. This becomes greatly thickened, and constitutes the bed into which the vessels of the chorial villi penetrate to form the future placenta.

Thus the fœtus is [illegible] enveloped by [illegible] membranes, viz.,

1. The inner layer of the amnion, in future simply called "THE AMNION," for the outer amniotic layer, as we have seen, has lost its identity in becoming amalgamated with the allantois and vitelline membrane to form—

2. THE CHORION.

3. THE DECIDUA REFLEXA.[1]

These three membranes persist until delivery, constituting the several layers of the [illegible]. In the progressive development of pregnancy the external surface of the amnion comes in contact with the internal surface of the chorion; the external surface of the chorion in contact with the internal

[1] It is said the decidua reflexa belongs exclusively to man. (Schroeder.)

surface of the decidua reflexa; the external surface of the decidua reflexa in contact with the decidua vera, covering the remaining parts of the uterine walls.

FIG. 44.



Showing front view of Reichert's embryo. × 4.

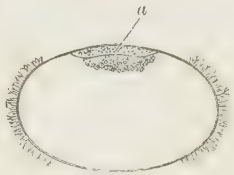
FIG. 45.



Showing side view of Reichert's ovum. × 4.

Before proceeding to describe the formation of the placenta it may be well to understand that our knowledge of the earlier stages of embryonic evolution has been derived almost entirely from examination of the embryos of other animals. Disappointing as it may be, it is nevertheless true that but very

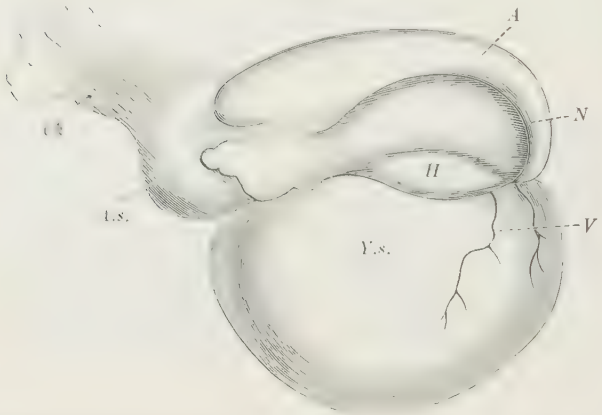
FIG. 46.



The same in diagrammatic section. (HIS.) × 5. *a*. Area germinativa.

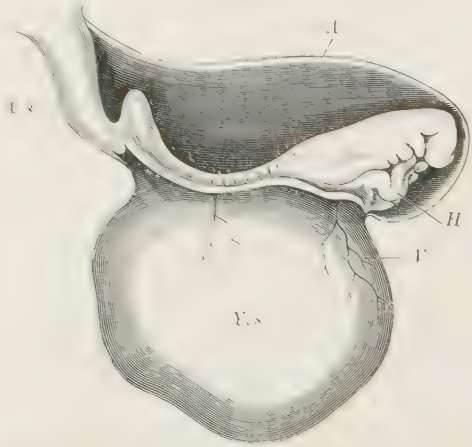
few human ova have been seen during the first two or three weeks after impregnation; during the *first* week *none;* during the *second* and *third* weeks only a limited few; and, moreover, these differ in some considerable degree from the ova of other organisms—still we must infer they are developed upon the same general plan. Reichert's ovum, supposed to be thirteen days old, and represented four times its natural size in Figs. 44 and 45, was found in the womb of a woman who

FIG. 47.



His's ovum, seen from right side. × 20. *A.* Amnion. *A.s.* Allantois connecting with *Ch.*, a part of the chorion. *H.* Heart. *V.* Bloodvessels of *Y.s.*, yolk sac, or umbilical vesicle. *N.* neural groove for spinal canal.

FIG. 48.



Human ovum during third week. *A.* Amnion. *A.s.* Allantoic stalk. *H.* Heart. *V.* Bloodvessels of *Y.s*, the yolk sac, or umbilical vesicle. (From HIS, after COSTE.)

committed suicide. It was flattened from side to side, something like a biconvex lens, the surface facing the decidua reflexa (shown in Fig. 45) being more convex than the other.

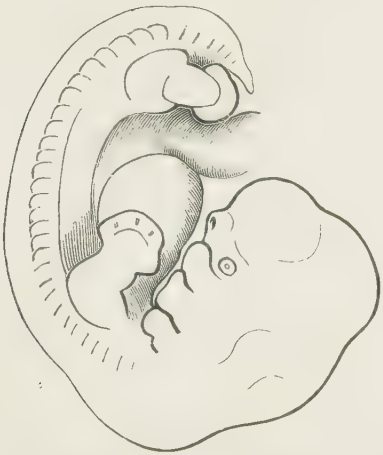
FIG. 49.



Human ovum, with contained embryo, about the end of third week. (From KÖLLIKER, after ALLEN THOMPSON.)

Fringes of villi projected only from its borders, the central portions of both surfaces being bald and circular, that toward

FIG. 50.



Human fœtus five weeks old. (From HIS.) × 5.

the uterus exhibiting also a smaller circular central space. It contained no trace of a fœtus.

A human ovum, fourteen days old, with embryo magnified twenty diameters, and obtained by His, is shown in Fig. 47, page 98.

Another human ovum, between fifteen and eighteen days old, as described by Coste, is shown, largely magnified, in Fig. 48, page 98.

At the end of the third week the whole ovum is covered with chorial villi, and on cutting it open the embryo may be seen as represented, of natural size, in Fig. 49, page 99.

The next illustration, Fig. 50, represents a fœtus near the end of the fifth week, magnified five diameters.

The more exact appearances of the fœtus at different periods of gestation are given in Chapter XXXIX., on the *Jurisprudence of Midwifery.*

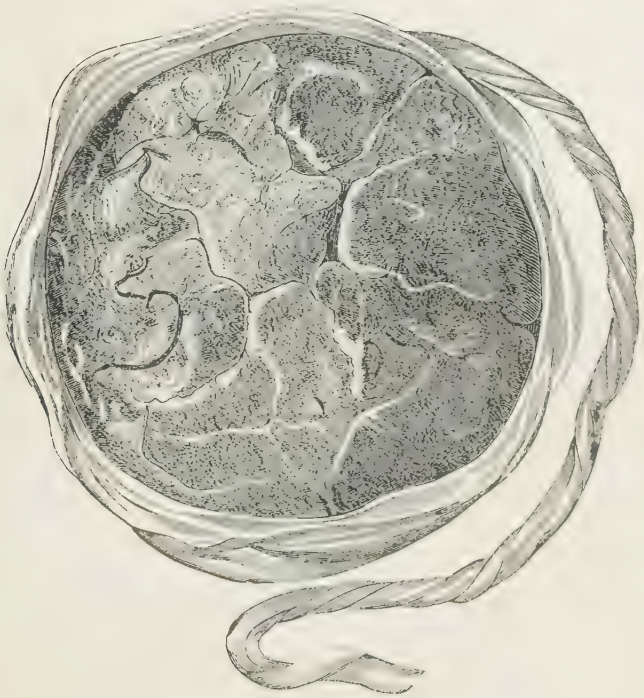
The Placenta.—The placenta at full term is a soft, spongy mass, irregularly saucer-shaped, seven or eight inches in diameter, three-quarters of an inch thick near the centre, and from one-eighth to one-fourth of an inch at the edge; average weight, twenty ounces. It varies much in all these particulars.

It begins to be formed about the end of the second month of gestation, and attains its essential characteristics in a few weeks more.

The *exact* mode of its development, its minute structure, and the *precise* relation of its bloodvessels with those of the fœtal vessels in the chorial villi, are matters regarding which there still remains great uncertainty. It may be sufficient for practical purposes to understand the following leading matters of fact about which there is no doubt, viz.: 1. The chorial villi, with their loops of bloodvessels, penetrate, like the roots of a tree, the thick decidua serotina. 2. The decidua serotina is also penetrated from its uterine surface by bloodvessels continuous with the curling arteries of the uterine wall. 3. At first the external coats of the villi and the mucous coat of the decidua serotina intervene between these two sets of bloodvessels, but later on these intervening soft structures are absorbed, and then the bloodvessels of the chorial villi (fœtal vessels) come directly in contact with the bloodvessels of the decidua serotina (maternal vessels). 4. Wherever this contact occurs the coat of the maternal vessels unites with the coat of the fœtal vessels to form one mem-

brane, and this last, growing very thin, still always remains as a membranous septum between the maternal and fœtal blood, and through it all the interchanges of matter between mother and child take place. 5. The two bloods never mix. On the contrary, the blood sent to the villi by fœtal arteries returns by fœtal veins, and that sent to the placenta by mater-

FIG. 51.

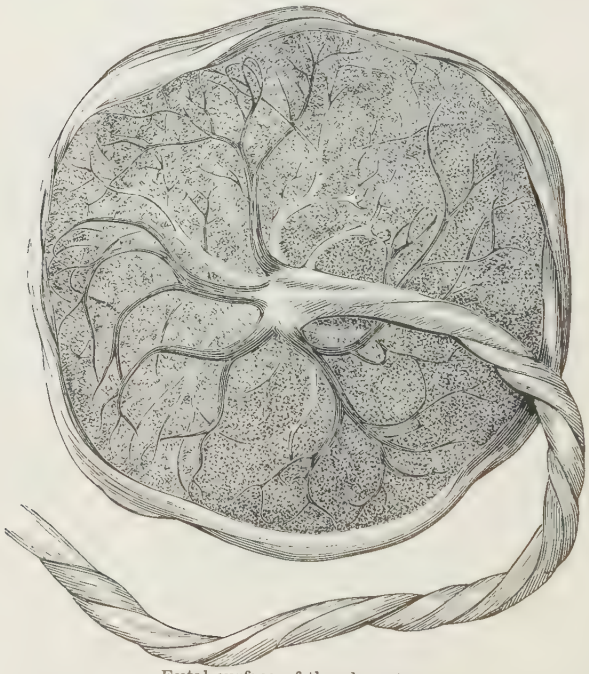


Uterine surface of placenta.

nal arteries returns by maternal veins. Possibly some of the *white* corpuscles of the mother's blood may "migrate" through the vessel-walls into the blood of the fœtus, but this has not yet been demonstrated. 6. The two sets of bloodvessels do not come in contact with each other along any definite straight

line, but at first the capillary loops, and later their branches, decussate with each other (like the surfaces of two apposed cogged wheels); and still later the two sets of branching vessels are confusedly united and irregularly interlaced and entangled with each other in a "most admired disorder," too complicated for brief description; yet, while the vessels tangle

Fig. 52.



Fœtal surface of the placenta.

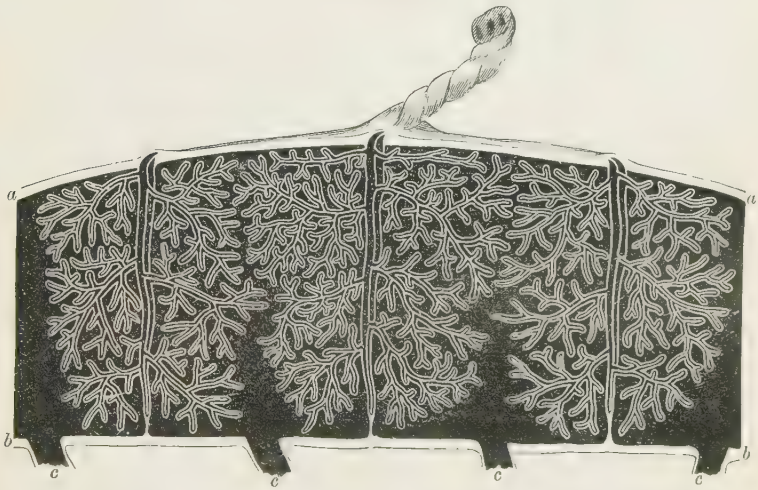
and adhere, the bloods never mix. The whole substance of the placenta is eventually made up of these two sets of vessels and their contents.

On inspection after delivery the uterine or external surface of the placenta presents a dark-red, rough, and uneven appearance, with irregular fissures dividing it into lobes, as seen in Fig. 51, page 101.

The internal or fœtal surface is smooth and glistening, while large bloodvessels may be seen and felt beneath its amniotic covering, as shown in Fig. 52, page 102.

The formation of the maternal *blood sinuses* in the placenta into which the chorial tufts of fœtal vessels dip (but the existence of which is yet a matter of dispute) is explained by the disappearance or dilatation of the walls of the maternal capillaries coming from the decidua serotina, so that a consider-

FIG. 53.



Vertical section of placenta, showing vascular tufts of chorion and blood lakes of placenta. *a*, *a*. Chorion. *b*, *b*. Decidua. *c*, *c*, *c*, *c*. Orifices of uterine sinuses.

able number of smaller vessels are thus converted into one large lake of blood. These blood cavities receive red blood from the uterine arteries, and return it by uterine veins. The tufts of fœtal capillaries from the chorion project into the blood sinuses thus formed, and are constantly bathed in the arterial blood therein contained, as is represented diagrammatically in Fig. 53.

The placenta is usually *situated* upon either the anterior or posterior wall of the uterus, high up near the entrance of the

Fallopian tubes. This is the rule; exceptionally there is no part of the uterus to which it may not be attached.

The Umbilical Cord (Navel String, Funis).—At first it is the root of the allantois, or that portion of the allantois extending from the body of the fœtus to the chorion. Later it remains the connecting link between the abdomen (navel) of the fœtus and the placenta. It contains two arteries which are continuations of the fœtal hypogastric arteries, and one vein—the latter without valves, although crescentic-shaped folds occluding two-thirds of the canal of the vein, and thus constituting imperfect valves, have been described. The umbilical arteries, at first straight, become, later, twisted around the vein. The vessels are imbedded in the so-called gelatin of Wharton, and the cord is covered externally by a layer of the amnion.

The cord is usually attached *near*, but not exactly *in*, the middle of the placenta. Sometimes it is inserted close to the placental margin, and is called then "battledore placenta" and "*insertio marginalis*." Very rarely it is inserted outside the placental border, into the membranes, the umbilical vessels subdividing and spreading out their branches before reaching the placenta: "*insertio velamentosa*."

Nutrition of Fœtus at Different Periods of Pregnancy.

1. At first it absorbs nourishment simply through the vitelline membrane. 2. The vitellus is absorbed and carried into the body of the fœtus by the branches of the omphalo-mesenteric vessels. 3. The chorial villi absorb nutriment which is conveyed to the fœtus by bloodvessels springing from the vascular allantois. 4. When a larger number of the villi have disappeared, the remaining one-third of the chorial tufts develop into the placenta.

Functions of the Placenta.—It not only *affords nutriment* to the child, but is also its *respiratory organ*. The umbilical arteries carry blue (venous) blood to the placenta, where carbonic acid gas is given off to the maternal blood, and oxygen taken in from it, so that the umbilical vein brings

back arterial (red) blood to the fœtus. The placenta is also an *organ of excretion* for the infant. Hence compression and obstruction of the cord kill the child.

Fœtal Circulation.—The umbilical vein after entering the umbilicus sends two branches to the liver, while its main trunk (the *ductus venosus*) empties directly into the ascending vena cava. The blood returned from the placenta by the umbilical vein goes, therefore, part of it to the liver,[1] whence it is returned by the hepatic veins into the ascending vena cava just above the entrance of the ductus venosus to join the current from this latter vessel. The blood from the lower extremities of the fœtus comes up through the vena cava, and thus mixes with the return blood from the placenta.

The ascending vena cava pours its blood into the right auricle of the heart, where it is directed by the *Eustachian valve* through the *foramen ovale* into the left auricle. From the left auricle it goes to the left ventricle; from the left ventricle to the aorta. The great bulk of this aortic stream passes through the large arterial branches of the aortic arch to the head and upper extremities. From these the blood returns by the descending vena cava to the right auricle; from thence through the tricuspid valve it passes into the right ventricle; and then it enters the beginning of the pulmonary artery, but the two branches of the pulmonary artery going to the lungs cannot receive this column of blood before respiration is established, so that there is a special blood-duct (the *ductus arteriosus*) provided for carrying the stream from the trunk of the pulmonary artery into the descending aorta, from whence part goes to the lower extremities, to come back by the ascending cava, while another portion passes along the umbilical arteries to the placenta. The umbilical arteries are continuations of the hypogastric arteries given off from the internal iliacs.

Changes Taking Place in the Circulation after Birth.—There is no longer any current of blood through the umbilical vessels. The navel string dries up and falls off. The umbilical arteries *inside* the abdomen remain permanent

[1] Authorities differ as to whether the larger portion of this blood goes to the liver or directly through the ductus venosus into the vena cava.

in a part of their course, constituting the *superior vesical arteries*. The ductus venosus and ductus arteriosus no longer admit blood, but shrivel up into fibrous cords. The foramen ovale closes, so that there is no longer any passage from one auricle to the other, and when the lungs are expanded by respiration the pulmonary arteries receive the blood which before went through the ductus arteriosus, and convey it to the lungs.

CHAPTER VII.

THE SIGNS OF PREGNANCY.

The signs of pregnancy require particular and careful study, for several reasons:

(1) Because unskilled persons very often, and the most skilful physicians sometimes, make mistakes in stating that pregnancy exists when it does not, or *vice versa*. (2) The question of pregnancy may involve character, as in unmarried females. (3) It may involve the legal rights of offspring. (4) It determines medical, surgical, and obstetrical procedures often of the gravest import. (5) It concerns the reputation of the physician: his errors subject him to ridicule.

Classification of Signs.—They have been divided into *presumptive*, *probable*, and *positive*, according to the degree of reliance to be placed in them as evidence of pregnancy. They have also been called *rational*, or such as are evident to the sensations of the patient; and *physical*, such as become apparent to the educated physician by physical examination. Probably the most practically useful method is to divide them into those that *are* certain and those that are *not:* hence, *first, Positive signs; second, Doubtful signs.*

The duration of pregnancy in the human female is forty weeks, or two hundred and eighty days, or ten months. In using the term "month" in this work it will be understood to mean a lunar month of twenty-eight days.

How Early during this Period is it usually Possible to Make a Positive Diagnosis of Pregnancy in Doubtful Cases where Important Interests are Involved?—It cannot be far from true to assert that the majority of general practitioners of medicine are not sufficiently skilful to make a positive diagnosis in such cases before the pregnancy is nearly half over. Even the most skilful can hardly obtain absolutely positive signs during the first sixteen weeks.

But little reliance can be placed upon the statements of the woman herself. Without being consciously untruthful, she may be deceived by her own sensations; and in other cases may wilfully mislead the examiner, even denying the *possibility* of pregnancy almost up to the time of delivery.

Positive Signs.—There are only *three* signs that are *absolutely* positive, viz.:

1. The fœtal heart sound.
2. Quickening, or active motions of the child.
3. Ballottement, or passive locomotion of the child.

Three others, though not so valuable, are usually classed with the positive signs, viz.:

4. The uterine murmur.
5. Intermittent contractions of the uterus.
6. Hegar's sign.

The Fœtal Heart Sound.—The pulsation of the heart can seldom be heard before the twentieth week (the middle of pregnancy). A practised, skilful ear *may* recognize it two or three weeks earlier. As pregnancy advances the sound gets louder and more easy of recognition, resembling that made by the ticking of a watch heard through a feather pillow. A good imitation of it may be produced by pressing the palm of one hand strongly against the ear, while on the back or cubital border of it a series of gentle touches, in quick succession, are made with the tip of the middle finger of the other hand, previously moistened with saliva; or a beginner may learn the sound by listening to the heart of a new-born child.

Failure to hear the heart sounds during the later months does not positively negative the existence of pregnancy, for the child may be dead; or the heart sounds may be very feeble; or thick tumors, etc., may intervene between the uterine and abdominal walls, interfering with the transmis-

sion of the sound; or the auscultator's ear or skill may be at fault.

The *frequency* of the fœtal heart sounds bears no relation with that of the mother's heart. They are independent of each other. The fœtal heart beats from one hundred and thirty to one hundred and fifty times a minute. It is generally a little less frequent in large children than in small ones. Very large children are usually males. Hence, attempts have been made to determine the sex before birth by the heart sounds, but little reliance can be placed in the method.

It is barely possible to mistake the sound of the mother's heart for that of a child in utero, as when, *ex. gr.*, the mother's heart, from fever or other cause, attains the same frequency as that of the infant; but this mistake could be avoided by noting if the mother's pulse beat *simultaneously* with the abdominal sounds.

When the sounds of the pulsations of the fœtal heart are distinctly heard, while the womb is found too small to contain a fœtus of sufficient size to yield a heart sound, and especially if the womb be but little larger than an unimpregnated one, it indicates *extra-uterine* fœtation.

Method of Examination.—Owing to the flexed posture of the child, the sign is transmitted through its *back*, which is in closer contact with the uterine wall than are the other parts of the infant's thorax. The back of the child usually lies against the lower part of the uterine wall on the left side. We listen for the sound, therefore, on the abdomen of the mother about the middle of a line drawn from the umbilicus to the centre of Poupart's ligament on the left side, or the region thereabouts. Failing to hear the sound there, the same region on the right side may be examined, and, if again failing, the whole surface of the abdomen may be explored. The sound may be rendered more distinct by pressing the palm of the hand on that part of the uterus opposite the child's back, so as to force the dorsal aspect of the infant against the side of the uterus to which the ear or stethoscope is applied.

Before the last three months of pregnancy we may hear the sound better over the median line in some cases.

In auscultation of the abdomen a stethoscope is used (the double one preferred), or the ear alone, one thin layer of clothing covering the surface in the latter method for the

sake of delicacy. For various reasons the stethoscope is better. The patient must lie upon her back, her limbs extended or moderately flexed, and the room be kept quiet. Feeble sounds are sometimes diverted by our fingers on the stethoscope. By wetting the mouth of the instrument, so that it will stick to the skin, it may be held in position by the head of the examiner while the fingers are removed.

QUICKENING.—This term *originated* from the erroneous supposition that the child became "*quick*," or alive, only after it began to move. It simply *means* active muscular motions of the child's limbs or body. The period at which fœtal movements may be first recognized varies very much; but to make a practical statement, and one easy of recollection, we may say *about the middle of pregnancy.* Then, and after then, an obstetrician of ordinary skill may feel the motions of the child, but the mother may be cognizant of certain sensations in the abdomen (described as "fluttering," "pulsating," "creeping," etc.), which she calls "feeling life," as early as the sixteenth or eighteenth week. Occasionally in examining the abdomen the physician, at this early period, or even before, may feel or hear with the stethoscope certain motions, which he *supposes* are fœtal movements, but these are scarcely reliable.

Late in pregnancy the motions, when violent, produce distortions and projections of the abdominal wall that may be *seen* as well as felt.

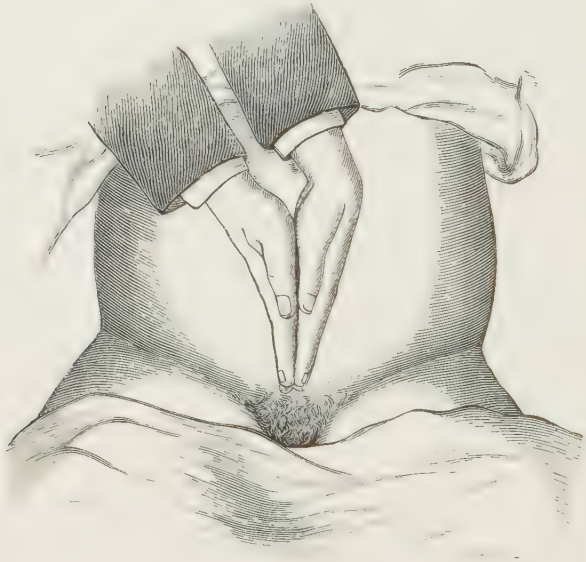
Failure to recognize these movements does NOT negative the existence of pregnancy; the child may be dead, or it may retain life and vigor, and yet fail to move, even during the physician's examination.

Contractile muscular motions in the abdominal, uterine, or intestinal walls; the movement of gas in the intestinal canal, and the pulsations of aneurisms and large arteries, may, it is just possible, be mistaken for fœtal movements by the inexperienced.

Method of Examination.—Late in pregnancy fœtal motions may often be discovered while the woman is standing or sitting, but it is best to place her on her back, with the thighs flexed, so as to relax the abdominal wall. *All* clothing, especially corsets and waistbands, should be removed from the entire abdomen. The bladder and rectum must be empty.

Place the woman near the side of the bed, and let the examiner stand close to *her* side, but facing her feet; his hands to be placed, palms together, as shown in Fig. 54, their ulnar borders being gradually separated and pressed down on each side of the uterus until that organ is held between them. One hand should now remain still while the other manipu-

Fig. 54.



lates the womb, feeling for any inequalities or projections produced by the fœtus. Pressure thus applied, first on one side then on the other, will usually cause fœtal motions, during which *both* hands should be held still, thus enabling the examiner to distinguish between active movements of the child itself and passive movements produced by his own manipulation.

Ballottement—Passive Locomotion of the Fœtus—is a sudden locomotion of the child in the uterine cavity, *produced* and felt by the physician.

Method of Examination.—The woman is placed in a position which will make the child settle, by gravitation, toward that part of the uterus where the examining finger is to be applied *per vaginam*. The best plan is to let her sit on the edge of a low bed and then lean back against pillows, so as to be midway between sitting and lying. The finger is now introduced and placed in front of the cervix, close to its junction with the body of the womb. (See Fig. 55.)

The other hand steadies the fundus uteri. A sudden upward, jerking, but not violent, motion is now executed by the examining finger, which will cause the fœtus to bound slowly upward to the fundus, and as it comes back again the finger will feel it knock against the neck (so to speak) of the uterine

FIG. 55.



Examination by ballottement: *A*. Sacrum. *B*. Rectum. *C*. Uterus and ovum. *D*. Bladder. *E*. Examining finger.

bottle in which it floats. The manipulation may be repeated several times to insure certainty. The position may be changed to a lying or standing one, and the finger put behind the cervix uteri, if the first examination be not satisfactory.

The standing position—the woman placing one foot on the lower round of a chair and the examiner kneeling in front of her—though indelicate, should always be tried when we fail to recognize ballottement in other postures.

If the abdominal walls be thin, *external ballottement* may be performed. The woman lies on her side, the abdomen slightly over the edge of the bed, and with a hand on each side of the womb the operator endeavers to move the fœtus up and down for the purpose already indicated, or he may apply

his hands to the womb in the manner just previously described for discovering fœtal movements—the woman lying upon her back, when, by gentle tapping with the finger-tips, the bound and rebound of the floating fœtus may be perceived.

Ballottement may be recognized earlier than any other of the positive signs, viz., from about the fourteenth or fifteenth week, and until within six or eight weeks of full term.

Toward the end of pregnancy the child so nearly fills the uterine cavity that it cannot be moved about. In multiple pregnancies, or where there is deficiency of the liquor amnii, the sign is unavailable for the same reason. The child may also be immovable when it is lying crosswise in the womb. Again, the operator may lack skill and acute tactile sensibility. During the first part of pregnancy the child is too light in weight to be felt with the finger through the uterine wall.

A calculus in the bladder; a pediculated subperitoneal fibroid tumor of the uterus; a prolapsed and slightly enlarged ovary, and a multilocular ovarian cyst may give results resembling ballottement, but they are found to be *outside* of the uterus—not *in* it—as may be discovered by the bimanual examination.

The Uterine Murmur.—This has been called *placental murmur*—placental souffle, or *bruit placentaire*—because it was thought to be produced by blood rushing through the "placental sinuses;" *uterine souffle* or murmur, on the supposition of its being caused in the same way in the arteries of the uterus; *abdominal souffle*, because it was believed to occur from pressure of the gravid womb upon the large vessels of the abdomen. It has also been referred to blood-changes, like those occurring in profound anæmia; and it is said a somewhat similar sound has been produced by pressure of the stethoscope upon the epigastric artery in the abdominal wall.

These theories are still unsettled. The one most generally received is that which refers the sound to the *uterine* blood-channels. The murmur has been heard several days after complete delivery of the placenta, and there is no substantial proof of its production in the vessels of the abdomen.

The most striking peculiarities of the uterine murmur are as follows:

1. It is a maternal sound synchronous with the mother's

pulse; 2. It is remarkably capricious or coquettish in character, changing often in tone, pitch, intensity, duration, and location, even while we listen, or it may be absent and again return; 3. It becomes stronger at the beginning of a labor-pain, ceases altogether at the acme of the pain, returns loud again as the pain goes off, and, after that, resumes the character it had before the pain began.

It is most usually recognized near the lower part of the abdomen, and necessarily so when first audible, because the womb does not yet extend high up in the abdominal cavity. Toward the end of the pregnancy it may be heard, of course, higher up. The stethoscope should be placed on the sides of the uterus, over the uterine arteries. It cannot generally be recognized before the *sixteenth week*, except by ears exceptionally acute and skilled. It remains afterward till full term, unless temporarily absent, as before explained. It is not an *absolutely* positive sign of pregnancy, because a sound resembling it may be heard in large fibroid tumors of the uterus, ovarian tumors, and other conditions. In fact, this sound never ought to have been classed with the positive signs. As years go by it is accorded less and less value.

Intermittent Uterine Contractions.—From about the twelfth week of pregnancy (when the womb has grown sufficiently large to be felt by the hand through the abdominal wall), until its termination, the uterus is constantly contracting at intervals of a few minutes. Though a valuable sign, from the early period at which this may be recognized, it is not an *absolutely positive* one, because the uterus may contract in a similar manner in its efforts to expel blood-clots, polypi, retained menses, fibroid tumors, and other products not connected with pregnancy. It is of great diagnostic value, however, as a corroborative sign when considered in relation with the history of the case.

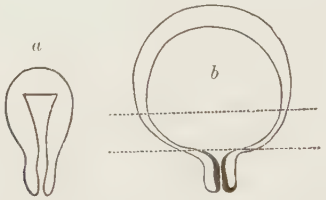
The contractions of a distended bladder, when its walls are much thickened by hypertrophy, might possibly be mistaken for a contracting uterus. Emptying the bladder by a catheter would readily settle this difficulty.

Method of Examination.—Let one hand grasp the fundus uteri and remain so doing for from *five to fifteen or even twenty minutes*. It will feel the womb harden (by contraction) in a very characteristic manner. The contractions last from two

to five minutes. Should the external examination alone fail to recognize the enlarged uterus, the bimanual method may be employed, one or two fingers of the other hand being passed into the vagina to elevate the uterus toward the hand already on the abdomen. It is of the greatest importance that the abdominal wall be relaxed, by flexion of the lower limbs, the woman lying upon her back, and all clothing and waistbands removed.

HEGAR'S SIGN.—This is a change in the *shape* and *consistency* of that part of the body of the uterus just above the cervix. The "pear-shape" of the unimpregnated uterus is changed to that of an "old-fashioned, fat-bellied jug"; that is to say, the lower segment of the body of the uterus, instead of widening *gradually* above its junction with the cervix, widens *suddenly* like an inverted *round-shouldered* demijohn, the neck of which may be compared to the neck of the uterus.

FIG. 56.



a. Pear-shaped virgin uterus. *b*. Jug-shaped uterus. The thinned segment is defined by the dotted lines. (Diagrammatic.)

(See Fig. 56.) Together with change of *shape*, the segment of the uterine body immediately above the cervix (the round shoulder of our fat jug, to continue the simile) becomes *soft, thin, yielding, and elastic* in *consistency*, while *above* this yielding part there remains a harder resisting portion of the uterine body.

Method of Examination.—If the vagina be spacious and the *abdominal walls lax and thin*, Hegar's sign may be demonstrated by passing the finger of one hand into the vagina high up behind the cervix uteri, while the finger-tips of the other hand make pressure externally above and behind the pubes, as shown in Fig. 57, page 115.

In cases where the fundus uteri inclines forward, the intra-vaginal finger should go up high *in front* of the cervix, while the fingers of the other hand make pressure externally *behind* the fundus, as shown in Fig. 58, page 116.

FIG. 57.



Demonstration of Hegar's sign by bimanual examination, the fundus being inclined backward. (SONNTAG.)

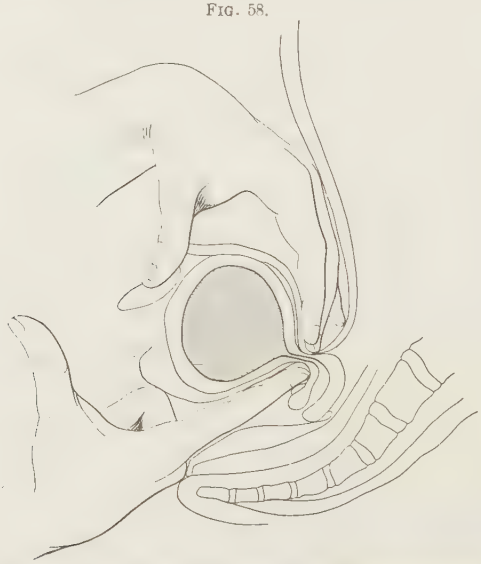
In cases (chiefly nulliparæ) where the vagina is *not* sufficiently spacious and the abdominal walls *not* sufficiently lax and thin to allow of this demonstration by the method above described, let the index-finger of one hand be passed into the *rectum high up, above the attachment of the utero-sacral ligaments*, the thumb of the same hand going into the vagina in front of the cervix uteri, while the fingers of the other hand make pressure externally behind the pubes, as shown in Fig. 59, page 117.

Another method is to *press the whole uterus down* with the external hand, while the finger is in the rectum and the thumb in the vagina, as just stated. The tissues just above the in-

ternal os uteri may now be compressed between the thumb and finger, and their thinness and elasticity demonstrated. Sometimes the intervening tissues feel as "*thin as a visiting card*," or the feeling may convey the impression of an apparent separation or loss of continuity between the cervix and body of the uterus.

Very rarely it may be necessary to anæsthetize the patient and draw down the uterus with a tenaculum or vulsellum forceps hooked into the vaginal portion of the cervix, in order to bring the thin portion of the uterine wall within reach of the examining fingers.

FIG. 58.

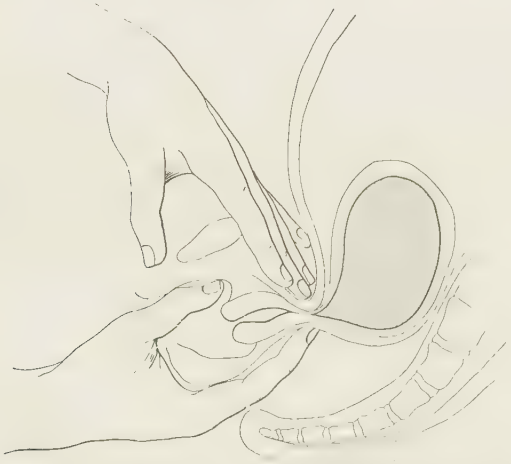


Demonstration of Hegar's sign by bimanual examination, the fundus being inclined forward. (SONNTAG.)

Hegar's sign has been recognized as early as the *sixth* or *eighth* week, and is of great value at this early date. In diseased conditions of the uterine wall it may be absent or unrecognizable, even though pregnancy exist. Some skilled observers assert that they have ventured a positive opinion from this sign as early as the *fifth* week, and which subse-

quently proved to be correct. The sign obtains more and more value in proportion to the *greater degree* of thinness and compressibility of the tissues concerned. When they can be so compressed as to yield the impression of an *apparent* separation between body and cervix the value of the sign is at its best. In a few instances this apparent separation has led to the erroneous diagnosis of extra-uterine pregnancy, especially where the cervix was hypertrophied, the enlarged cervix having been mistaken for the body of the uterus, while the enlarged body of the pregnant womb was taken for an extra-uterine cyst. A pre-existing lateral flexion of the uterus would increase the liability to such a mistake. Caution accordingly.

FIG. 59.



Demonstration of Hegar's sign by recto-vaginal examination. (SONNTAG.)

Nearly allied to Hegar's sign, and often associated with it, is the detection of *fluctuation* in the thin uterine segment, especially of the anterior wall. It is best recognized by passing *two* fingers into the vagina, and manipulating, first with one, then the other, while the womb is steadied by the remaining hand outside of the abdomen. It may be felt as early as seven or eight weeks, but requires an educated finger. The bladder should have been previously emptied by a catheter.

It was first pointed out by Dr. Adolph Rasch. Sometimes the soft segment of the uterine *body* seems to overlap the *cervix* at the anterior fornix of the vagina, thus presenting a sort of ridge or fold easily felt by the examining finger.

Additional Physical Signs.—In addition to the foregoing six positive signs, auscultation may reveal one or two others of less value. These are: 1. The *funic* or *umbilical souffle*—an intermittent, hissing sound, synchronous with the fœtal heart, supposed to come from the umbilical arteries when the funis is coiled round the child's body or neck. 2. The "*fœtal shock*"—this conveys to the ear a combined sensation of shock and sound, and is probably produced by the pressure of the stethoscope moving the fœtus passively. It is *intermittent* recognized by the ear, instead of the *finger*. 3. Sounds produced by *active* motions of the child. It is "*quickening*" recognized by the *ear*, instead of the *hand*. This last is of some value, since it may be occasionally recognized earlier than the other auscultatory signs—viz., by the end of the twelfth week. Neither of these three additional signs, however, is comparable, in practical value, with the six previously mentioned.

Doubtful Signs of Pregnancy.—These are difficult to define numerically, but for convenience of recollection we may enumerate *five* that are easy of recognition and *five* others that are somewhat less so. Each of these ten signs, however, includes a variety of phenomena. They are as follows:

First Five.

1. Suppression of the menses.
2. Changes in the breasts and nipples.
3. Morning sickness.
4. Morbid longings and dyspepsia.
5. Changes in the size and shape of the abdomen.

Second Five.

6. Softening and enlargement of os and cervix uteri.
7. Violet color of vagina.
8. Kiestein in the urine.
9. Pigmentary deposits in the skin.
10. Mental and emotional phenomena.

Besides these there are a few residual odds and ends by which the list of gestation signals may be completed.

1. Suppression of Menses.—Menstruation is suppressed during pregnancy, because what would have been *menstrual* blood in the absence of impregnation is now appropriated to the development of the ovum and reproductive organs. There is no ovulation during pregnancy. Suppression of the menses is a very doubtful sign, because, exceptionally, menstruation (and even ovulation) may occur during gestation. Cases are seen, *very* rarely, in which menstruation occurs *only* during pregnancy. Suppression of the menses may take place from cold, mental emotion, and many causes other than pregnancy. Again, the sign may be unavailable in cases where impregnation occurs at puberty, before the menstrual function is established; or during lactation, when it is absent; or in women whose menses are wanting from anæmia or debility.

When menstruation occurs during pregnancy it seldom recurs every month throughout the whole period; more frequently it ceases after the first three or four months. In the latter case the flow is *supposed* to come from that portion of the decidua vera with which the expanding decidua reflexa has not yet come in contact. After the contact named takes place, there is no further menstruation.

2. Changes in the Breasts and Nipples.—The *mammary glands* become firmer, larger, more movable; their blue veins more easily visible; and sensations of weight, pricking, tingling, etc., in them may be noticed by the patient. There are also a few light-colored silvery lines radiating over the projecting breasts.

The *nipples* become enlarged somewhat, and more distinctly prominent, or erect; and a sero-lactescent fluid oozing from them dries into branny scales upon their surface.

The *areola* or disk, surrounding the nipple, gradually becomes darker in color, varying with the complexion of the individual, from the lightest brown tint to black. Upon the surface are seen ten, twelve, or more *enlarged follicles*, which project one-sixteenth or one-eighth of an inch. They vary in size, and contain *sebaceous matter*.

On the white skin *just outside*, but immediately surrounding the colored disk, the *secondary areola* subsequently appears.

In vessels of small, undevated spots, of a darker color than the surface on which they rest; hence they are said to resemble spots produced by drops of water falling upon a tactile surface and discharging the color." There is one complete row of these glands close together round the dark areola, and other scattering ones a little further off that are less distinct.

Secretion of Milk.—In a woman who has never been pregnant before, this is considered a very valuable corroborative sign. Milk, in exceptional instances, runs from the breast weeks before delivery, and a drop of lactescent fluid may be squeezed from the nipple as early as the twelfth week of gestation in some cases.

The times at which these several breast signs appear are as follows: The *areolæ round* does not become visible till the twentieth or twenty-fourth week; the *tubercles* do not appear till near the end of pregnancy; and nearly all the other signs in these parts commence from the eighth to the twelfth week, and then become more pronounced as pregnancy goes on.

What degree of reliance can be attached to these signs?—They are totally unreliable, taken alone. In conjunction with other early signs they may lead us to suspect the existence of pregnancy, but such a suspicion should not be crystallized into an expressed opinion until more positive signs appear. They cannot disprove negative pregnancy.

Conditions resembling these may occur from uterine or ovarian diseases independent of gestation. Many of them continue a long time after delivery, and might thus be erroneously attributed to a supposed succeeding pregnancy. Conditions of the soft tissues during pregnancy is suspected during lactation, or after a miscarriage or abortion. The secretion of milk has been produced artificially, not only in females, but even in males.

Enlargement.—The occurrence of the secondary areolæ, the secretion of milk, and the fact of our being able to force a drop of lactescent fluid from the nipple, deserve great consideration; but in estimating them they must be taken in connection with the whole of the symptoms. The secretion of the milk sometimes in nursing women is of considerable value as a corroborative sign.

3. Mental Symptoms.—This consists in nausea, which may not be accompanied by vomiting, or may vary

in the morning, or it may take place at or after the morning meal.

It usually begins about the fourth or fifth week and lasts until the end of the sixteenth, or later. Sometimes it comes on a few days after impregnation, and continues throughout pregnancy.

It is a sympathetic disturbance, most likely due to a degree of congestion of the uterus beyond the physiological limit, and for which it is, to some extent, a natural corrective. Sexual excitement after conception is probably a factor in its production.

It justifies the suspicion of pregnancy only when it occurs and persists without any other special cause and in a woman who is otherwise healthy and well.

4. Morbid Longings and Dyspepsia. Some pregnant women have an unusual desire for sour apples and other acid fruits, or drinks, and salads prepared with vinegar, etc., or there may be a liking for substances still more unpalatable, such as chalk, ashes, lime, charcoal, clay, and slate pencil; even putrid meats and spiders have composed a part of the chosen *menu*. Occasionally there is entire loss of appetite, or a disgust for particular substances.

Heartburn, pyrosis, flatulence, and unpleasant eructations are of common occurrence.

These dyspeptic symptoms and morbid longings begin about the same time, and have about the same diagnostic value as morning sickness, and their duration is equally uncertain.

5. Changes in the Size and Shape of the Abdomen. —During the first eight weeks of pregnancy the abdomen is really flatter than before, and presents no increase in size. This is due to sinking down of the uterus, which pulls the bladder down a little, and the bladder, in turn, by means of the urachus, draws the umbilicus inward, so that the navel and its immediately surrounding abdominal surface appear drawn in instead of prominent. Hence the oft-quoted French proverb: "*Ventre plat, enfant il y a.*"

> "In a belly that is flat,
> There's a child—be sure of that."

But you cannot be *sure* of it.

By the twelfth week the fundus uteri begins to rise above the brim of the pelvis, where it can be felt with the hand over the pubes. The navel is still sunken.

At the sixteenth week the fundus has risen about two inches above the symphysis pubis. The navel is no longer unusually sunken.

So the vertical enlargement progresses at the rate of about one and a half to two inches every four weeks, until the fundus, at the thirty-eighth week, almost touches the ensiform cartilage. During the last eight weeks the umbilicus protrudes beyond the surface.

About two weeks before delivery the womb sinks down a little, the abdomen becomes less protuberant at its upper part, and appears smaller in size. This is generally ascribed to relaxation of the pelvic ligaments and soft parts.

We may more easily remember the position of the fundus at different stages of pregnancy by dividing the whole term into thirds, as follows:

At the end of the *first* third the fundus rises a little above the pubes—say it is *at* the pubes.

At the end of the *second* third it reaches the navel.

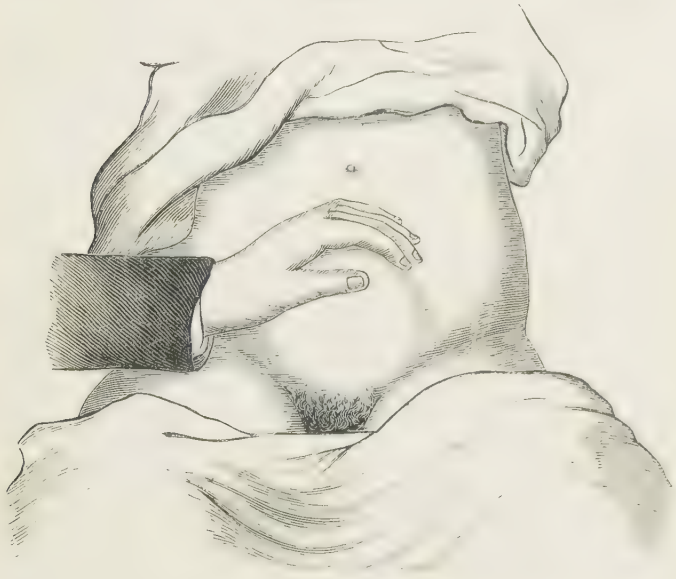
At the end of the *third* third it reaches the ensiform cartilage, allowing for sinking during the last week or two.

By subdividing the intermediate spaces into thirds, and allowing one-third of upward expansion of the fundus for each four weeks, we shall attain approximate precision sufficient for practical purposes, for there are great differences in different cases.

The principal characteristics by which enlargement of the abdomen from pregnancy may be distinguished from other kinds of abdominal swelling are as follows: The pregnant womb is usually *symmetrical in shape*; it is *longer vertically* than transversely; its *contour is smooth and even*; it possesses a peculiar *soft, elastic consistency*, and may be felt to *contract under palpation*. By careful, firm pressure it may also be felt to contain a *movable, floating solid body*—the fœtus. It is not easy to distinguish these peculiarities by palpation of the abdomen. The sense of touch must first be educated by long practice, and even then, in doubtful cases, the *history, origin, duration*, and *accompanying symptoms* of the enlargement must be fully studied before we can attach to them much diagnostic importance.

Method of Examination.—To ascertain the size and other characteristics of the gravid womb by palpation, either the mode of manipulation already mentioned under "Quickening" (page 110) may be used, or one hand may be placed upon the abdomen, as shown in Fig. 60. In this illustration the left hand is used, the examiner standing to the right of his patient. The hand is curved to fit the contour of the uterus and placed, at first, low down over the hypogastric

FIG. 60.



region. Intermittent pressure is now made, and during each intermission the hand is carried gradually higher up, the pressure being greater at the ulnar border of the hand, so that when the fundus of the womb is reached the hand at once recognizes the diminished resistance and sinks deeper into the abdominal space above the uterus. Detection of the enlarged uterus is easy late in pregnancy. During the earlier months, when the tumor is not well above the pelvic brim, it is more difficult. In these latter cases let the lower

limbs of the woman be extended and slightly separated; then place both hands flat upon the abdomen and make continued firm pressure while the woman takes several deep inspirations. During the consequent expirations the resistance of the abdominal walls will finally yield, and the hands be enabled to explore the region of the pelvic brim and demonstrate the enlarged womb. Beware of mistaking a distended urinary bladder, or one whose walls are hypertrophied and in a state of contraction, for a contracting pregnant uterus. Fibroid and other tumors of the uterus; cystic and other tumors of the ovary; distention of the womb from retained menses; accumulations of fluids or gases; obesity; pseudocyesis; enlargement of liver, spleen, and other of the abdominal viscera, etc., may lead to enlargement of the abdomen simulating pregnancy. The history and duration of the swelling, together with accompanying symptoms, should prevent its being mistaken for gestation. (See Differential Diagnosis, page 128)

6. Softening and Enlargement of Os and Cervix Uteri.—In making a digital examination *per vaginam* the differences to be noted between a *virgin* uterus and an impregnated one are very characteristic; but between the impregnated and unimpregnated uterus of a woman who has already borne children the differences are less marked.

Scarcely any change takes place during the first few weeks of pregnancy other than the alteration of position in the womb already noted, together with increased weight and consequent diminished mobility of the organ.

The chief characteristic of the virgin cervix uteri is *firmness* of consistency. Very soon after impregnation it begins to *soften* and *enlarge* circumferentially. The lips of the os externum become wider and puffy to the touch, and the fissure of the os becomes rounder and larger. The softening begins at the outside (vaginal surface) and lowest part of the cervix and gradually extends upward and inward until the compact nodule of the virgin cervix is converted into a soft, elastic projection whose length is *apparently* shortened by increase of width and diminished resistance to the examining finger.

These changes begin soon after conception, but scarcely become easy of recognition till about the fifth or sixth week. In sixteen weeks the *lips* of the os are softened; in twenty weeks

half the cervix is soft, and the *whole* of it has undergone the same change when the "term" is within a month of completion.

After one child the cervix never goes back to its pristine virgin firmness, nor does it recover the perfect smoothness of surface and smallness of the external os characteristic of the virgin uterus.

Again, during a first pregnancy the os will not admit the end of a finger; during a subsequent one it generally will.

The *diagnostic value of softening and enlargement of the cervix uteri* is only relative; their *absence* would generally *negative advanced* pregnancy; but as they may occur from other causes, the affirmative evidence they furnish is not reliable.

7. Violet or Dusky Color of Vaginal Mucous Membrane.—By Jacquemin (who first discovered this sign in examining the prostitutes of Paris) and others, it has been considered to furnish positive evidence of pregnancy, especially during the early months. This is an error. The discoloration is due to venous congestion, and conditions closely resembling it may occur from uterine or vaginal congestion independent of pregnancy; as it can only be observed by inspection, it is not always available.

8. Kiestein in the Urine.—When the urine of a pregnant woman is kept for some days (it *may* require weeks) at a temperature of about 70° F., a flocculent, woolly-looking cloud begins to form in the centre of the liquid, which gradually rises to the surface, like a pellicle of grease on cold broth; and, later, the film breaks up and falls to the bottom of the vessel. This is kiestein. It occurs from the eighth week to the thirty-second, or thereabouts, and then disappears. It consists of a "proteine substance, triple phosphates, fungi, and infusoria" (Lusk), so often seen in decomposed urine, and is of little diagnostic value, inasmuch as it occurs in the urine of men and non-pregnant females.

9. Pigmentary Deposits in the Skin.—Besides darkening of the areola of the nipples before mentioned, there is occasionally a brown, areolous blush around the umbilicus, which may extend along the median line to the pubes. It varies with the complexion of the patient. In rare instances

the color covers the whole abdomen, and cases are recorded of its spreading over the entire body.

It is of little value for diagnostic purposes.

10. Mental and Emotional Phenomena.—A marked change of temper in the woman, as from amiability to peevishness, from cheerfulness to melancholy, etc., or exactly opposite changes, may occur. In some women the *moral* sense is depraved, or elevated; and *intellectual power* may be modified in degree.

These signs are only of corroborative use in diagnosis. They are generally more apparent to the household than to the physician.

Additional Signs.—The following additional signs may be noted: Toothache, or facial neuralgia, or actual caries of the teeth, during successive pregnancies; salivation without mercury; a tendency to syncope in women not disposed to faint when unimpregnated. Some women date impregnation, and often correctly, from unusual gratification during a particular act of coition.

The introduction of a clinical thermometer into the cervix uteri is said to indicate an elevation of temperature (1° or 2°) when pregnancy exists.

None of these indications are reliable.

Signs During each Month.—The different signs recognizable during the different *lunar* months may assist the obstetrician in judging the duration of an existing pregnancy and probable date of delivery. They are as follows:

First Lunar Month.—Absent menses. Gastric and mammary signs may, rarely, begin thus early. Tip of cervix begins to soften by end of month. Slit of the os more circular. Uterus sinks. Umbilicus depressed.

Second Month.—Mammary and gastric signs *usually* begin. Uterus sinks; hypogastrium slightly flat; umbilicus depressed. Softening of cervix extending higher. Menses suppressed, as during remaining months. Hegar's sign perceptible.

Third Month.—Gastric symptoms continue; mammary signs increase. Womb still sunken; os low in vagina; navel still

hollow; hypogastrium still flattened; progressive softening of os and cervix. At *end* of this month womb begins to rise above brim of pelvis, with consequent higher position of cervix and less flattening of abdomen and sinking of navel.

Fourth Month.—Gastric symptoms commonly subside. Breast signs further develop. Continued ascent of uterus, hence cervix higher in vagina, navel less hollow, abdomen less flat, or beginning to enlarge. Fundus uteri by end of this month is two inches above pubes. Progressive softening of cervix. Woman *may* "feel motion" toward end of the month, when skilled examiner may also detect ballottement and intermittent contractions. Uterine souffle audible by stethoscope. Very acute hearers claim to hear heart-sounds —very *un*usual.

Fifth Month.—Breast signs increase. The "secondary areola" appears. Quickening commonly occurs. Gastric symptoms entirely relieved. Ballottement easily recognized. Heart-sounds audible. Uterine murmur. Cervix softer, and *apparent* shortening begins. Fundus midway between pubes and navel. Abdomen visibly enlarged. Umbilical depression diminished.

Sixth Month.—Ballottement, heart-sounds, fœtal motions, and uterine souffle more distinct. Lower half of vaginal cervix softened. External os may just admit *tip* of finger by end of this month; this doubtful in primipara, though just possible. Breast signs and "secondary areola" increased. Umbilical depression almost effaced. Uterine tumor distinct. Fundus up to or just above navel. *Apparent* shortening of cervix increased.

Seventh Month.—Ballottement continues; auscultatory signs still more audible. Fundus two inches above umbilicus. Depression of navel well-nigh or quite effaced. Vaginal cervix *apparently* reduced one-half in length; lower two-thirds of it softened. Cervix still higher in vagina. Breast signs increased. External os may admit finger-*tip* even in primipara.

Eighth Month.—Ballottement doubtful; other physical signs more audible. Greater part of cervix soft, and "*apparent*" shortening increased. Abdomen distended, and distinctly pyriform in shape. Umbilical depression gone. Fundus midway between navel and ensiform cartilage. Os higher and difficult to reach. Breast signs increased; milk *may*

be secreted in some quantity in multiparæ. Umbilicus may begin to protrude toward last week.

Tenth Month.—Ballottement absent; other physical signs more distinct. Umbilicus protrudes beyond surface of abdomen. Fundus still higher than last month. External os will easily admit finger-tip; and, in multipara, os and cervix will admit finger to feel fœtal head and membranes. Lips of os thick and soft, and apparent shortening of cervix rapidly progresses.

Tenth Month.—Height of os and fundus and prominence of mammæ reach their maximum about middle of month, and then begin to lessen. Cervix uteri obliterated by *real* shortening during thirty-ninth and fortieth week. Lips of os in primipara become thinner; in multiparæ, retain more thickness till the end. Presenting part low down. Os uteri easily reached. Physical signs distinct. Symptoms due to pressure increase. There may be œdema of legs and genitals, with pain and difficulty in walking.

Differential Diagnosis of Pregnancy. *From Ovarian Tumors.*—In ovarian tumors (cystic degeneration of the ovary) the positive signs of pregnancy are absent: menstruation *generally* continues; there is fluctuation; history of tumor shows it to be of longer duration than pregnancy, and to have begun on *one side* of the abdomen; cervix uteri not softened; womb not enlarged, and can be moved without moving tumor; or, when tumor is rolled to one side by abdominal palpation, cervix uteri does not participate in the movement, as demonstrated *per vaginam*. When the tumor is large there is emaciation, especially of the face, and failure of the general health. Exceptions to be borne in mind, *e. g.*:

Pregnancy and ovarian tumor may coexist, when abdominal palpation will reveal two tumors of different consistency, with a possible saliency between them. Diagnosis difficult, especially when associated with dropsy of ovarian cyst or excess of liquor amnii. In the latter fluctuation is more superficial; cervix uteri enlarged and softened; womb does move with movement of tumor. After having decided to operate for ovarian tumor, should any lingering doubt remain as to pregnancy, the womb may be measured by the uterine sound, or the os dilated to admit examination by the finger; or aspiration of fluid and its subsequent examination resorted to.

Amniotic fluid contains—	Ovarian fluid contains—
Epithelial cells.	Epithelial cells.
Oil globules.	Oil globules.
Albumen, but no paralbumen or metalbumen.	*Granular, non-nucleated ovarian cells, which become transparent, but not larger, by acetic acid.*
Meconium (?).	Paralbumen.[1]
Urinary salts (?).	Metalbumen.[1]
Sp. gr. 1.005–1.010.	Albumen.
Reaction alkaline.	Cholesterine.
Usually clear and limpid.	Sp. gr. 1.018–1.024.
Lanugo (?).	Usually sticky and tenacious.
(Those marked with a note of interrogation are fœtal products, occurring only late in pregnancy.)	

From Fibroid Tumors of Uterus. (Fibrous tumors, Fibromata.)—In uterine fibroids, tumor is (comparatively) harder and more inelastic; it is unsymmetrical and nodular in outline; of much slower growth than pregnant womb; is accompanied with profuse menstruation; cervix not softened, but may be unevenly enlarged. Positive signs of pregnancy absent.

Rarely fibroids may coexist with pregnancy. Diagnosis: by physical signs of pregnancy and results of time. Labor will come on, and may terminate naturally, provided tumor does not obstruct pelvis.

From Distention of Uterus due to Retained Menses—Hæmatometra.—In retention of menses there is a history of pain at the menstrual periods; uterine tumor grows by sudden enlargement at each period, with some decline in size afterward.

[1] Dr. Thomas (Diseases of Women, fifth edition, 1880, p. 687) gives the following tests:

1. "*Test for Paralbumen.* Leave the fluid at rest in a cool place, filter or decant, and thus separate sediment from supernatant fluid. Pass a stream of carbonic acid gas through this fluid, and instantly a precipitate of fine flocculi of paralbumen will occur."

2. "*Test for Metalbumen.* Digest another portion of this fluid with absolute alcohol for three days. Filter off the precipitate and heat with distilled water. Filter again, and metalbumen will be precipitated by sulphate of magnesia. Paralbumen is precipitated from this fluid by a few drops of dilute acetic acid, and redissolved by an excess."

[While paralbumen, as Dr. Thomas states, will be precipitated by carbonic acid gas, this is only a *property* of that substance, not a *test*. Liquor amnii contains an organic substance—a form of globulin—which is also precipitated by carbonic acid gas.—A. F. A. K.]

Vaginal examination reveals mechanical obstruction, either in vagina or uterus, preventing egress of menses—this may be congenital, or acquired as result of inflammation, adhesion, etc. The breast signs and positive signs of pregnancy are absent.

From Distention of Uterus due to Gas—Physometra.—This is really a *tympanites* of the uterus. The gas, retained by some obstruction in the cervix, is due to decomposition of matters within the uterine cavity. Womb enlarges more *slowly*, and to a *less degree* than in pregnancy. When large enough to be percussed, it is *resonant*. When lifted with the finger, *per vaginam*, it is lighter in weight than its size would indicate. Fetid gas may escape from the vagina. Positive signs of pregnancy absent.

From Distention of Uterus due to Watery Fluid—Hydrometra.—The fluid accumulates in the uterine cavity, owing to obstruction in the cervix. Womb seldom larger than an orange, and grows slowly. Most apt to occur after "change of life." Fluctuation may be detected. Absence of positive signs. Hydrometra and physometra are extremely rare.

From Obesity.—In enlargement of abdomen from fat, other parts of the body are enlarged; belly is soft and doughy to touch, and without any central uterine tumor. The positive signs of pregnancy and most of the signs about the breasts, etc., are absent. The cervix uteri remains small and unsoftened.

From Abdominal Dropsy—Ascites.—In dropsy there is distinct fluctuation and no uterine tumor. Resonance on percussion of abdomen changes its boundary line (horizontally) by changing position of woman, owing to floating of intestines; cervix uteri unchanged; physical signs of pregnancy absent.

From Amenorrhœa associated with Congestive Enlargement of Cervix Uteri.—This is accompanied with symptoms of uterine inflammation; backache; pains in the hips, abdomen, etc.; weight in perineum; difficulty in walking; and, on examination, the cervix uteri is tender to the touch. Time will clear up doubt. If pregnancy exist, enlargement of the *body* of the womb will soon declare it.

From Pseudocyesis.—This means "false" or "spurious pregnancy." Women who *want* to be pregnant, and single women having reason to *fear* pregnancy, are apt to imagine themselves *enciente* when they are not.

It occurs most often near the "change of life," when cessation of the menses, obesity, and various sympathetic phenomena appear to lend color to the false impression. There are hysteria and involuntary projection and contraction of the abdominal walls, simulating the enlarged womb and fœtal movements, so-called "phantom tumor."

Diagnosis: anæsthesia by ether at once disperses the abdominal signs, and vaginal examination reveals an unchanged cervix uteri, and an empty, unenlarged uterus.

From Tympanites.—Tympanitic distention of the abdomen gives tympanitic resonance on percussion. Physical signs of pregnancy absent. Uterus not enlarged. Tympanites and pregnancy may coexist. Exclude the latter by making *continuous* firm pressure upon the abdomen during several successive respirations, *increasing* the pressure during the expiratory acts, until the examining hands—one placed upon the other—feel the spinal column, and thus demonstrate the absence of any intervening enlarged womb. The abdominal enlargement of pregnancy is chiefly in an anterior-posterior direction during the early months—not from side to side—while in tympanites it is in both and all directions.

Methods and Order of Examination.—In examining a woman for suspected pregnancy the order of sequence in the several steps of the examination should be as follows:

1. Oral examination as to history, symptoms, and duration of the case.
2. Examination by (*a*) inspection, and (*b*) palpation of breasts and nipples.
3. Examination of abdomen by, successively, inspection, palpation, percussion, and auscultation.
4. Vaginal examination: (*a*) digital, (*b*) bi-manual, (*c*) by *inspection if necessary.*
5. Digital examination, per rectum, if required.

CHAPTER VIII.

HYGIENE AND PATHOLOGY OF PREGNANCY.

To anticipate the pathological phenomena of pregnancy without surprise we have only to recall the physiological changes that must necessarily take place with every gestation. Processes of *change*—of structural evolution—whether progressive or retrogressive, and whether occurring in man, woman, or child, are *always* liable to be interrupted by slight disturbing causes, and thus develop *pathological* phenomena of more or less gravity. The physiological changes incident to pregnancy are without a parallel, in their degree, in their number, and in the rapidity with which they occur. In a few months the uterus increases in *size* (from 3 to 12 inches in length; from 1½ to 9 in width); in *weight*, from about an ounce to about two pounds, *not* including its contents. The capacity of its cavity is enlarged 519 times (Lusk, after Krause). The area of its external surface is increased from 16 square inches to 339 square inches. *All* of its tissues: its muscles, ligaments, arteries, veins, lymphatics, nerves, and nerve-ganglia, become tremendously hypertrophied. Correlative changes in the abdominal walls, and in the position of the abdominal viscera, must also occur to accommodate the enlarged womb. The vagina and vulva undergo a somewhat similar hypertrophy, though less pronounced. Changes also take place in the folds of peritoneum and connective tissue in the pelvic cavity, as well as in the ligaments, cartilages, and joints of the pelvis itself. At the same time the mammary glands are quietly going through a hypertrophic evolution preparatory to lactation.

With these local phenomena must necessarily take place an extensive modification in the general system of the woman, especially with reference to the general nutrition. She provides the nutritive pabulum by which the growing organs are sustained, and by which the fœtus, with its appendages and bag of waters, is built up. She must therefore form more blood, digest more food, and increase the activity of her excreting

and secreting organs. The extra blood must be properly circulated, not only through the hypertrophied vessels of the enlarged reproductive organs, but also through the placenta; hence, in pregnancy, there occurs, normally, hypertrophy of the left ventricle of the heart, which disappears after delivery. The elimination of carbonic acid by respiration is increased. In short, the pregnant woman has to provide nutriment, to breathe, to circulate blood, to secrete and excrete, for *two* individuals—herself and her fœtus.

The suspension of ovulation and menstruation during pregnancy constitute further changes of function, which, while natural enough, must add something to the expenditure of vital force.

With these varied and numerous structural and functional changes, and with the necessary increase of work imposed on the general nutritive system of the pregnant woman, it is scarcely to be expected that gestation, especially in women whose lives and habits are artificial and unnatural in many respects, should be altogether *latent* and free from unpleasant symptoms, if indeed it be unaccompanied with serious disease. The wonder is rather the other way, viz.: that suffering is not greater and diseases more frequent and severe than we find them. It may be well said: to breed easily is a good test of bodily soundness.

The abnormal surroundings and habits of pregnant women, especially in highly civilized communities, are more accountable for suffering and discomfort than is the pregnancy itself. Faulty hygiene, either from careless neglect, or ignorance, is often the real cause of disaster and distress. To preserve health is easier and better than to cure disease. With this view the following directions will be of service:

Hygiene and Management of Normal Pregnancy.—Let every pregnant woman breathe *pure air;* hence the atmosphere of the country is better than that of a city, out-door life (climate and weather permitting) better than indoors. Rooms to be well ventilated by having one or more windows down, even ever so little, *from the top;* atmospheric impurities usually accumulate *toward the ceiling.* Crowded apartments, theatres, churches, etc., should be avoided. Many pregnant women become peculiarly sensitive to disagreeable odors (*hyperosmia* has been noted as one of the signs of pregnancy), as if

nature had provided them with a special instinct to detect and escape infected atmospheres. Throughout pregnancy the elimination of carbonic dioxide is increased about 25 per cent., and during the later months the encroachment of the enlarged uterus toward the diaphragm impedes respiration; hence *pure air* becomes a prime necessity. Unfortunately, respiration is further restricted by *dress* (notably *corsets*) and by *muscular indolence*. Corsets should be discarded altogether during the later months or worn loosely, or, if persisted in, their "ribs of steel" should be interrupted with spaces of elastic fabric—a method of construction commonly provided by staymakers for pregnant women. Avoid waist-bands and girdles round the abdomen; let the weight of skirts be supported by suspenders from the shoulders. Garters, whether above or below the knee, may produce œdema of the feet and varicose veins in the leg. Among other vices of costume are high-heeled shoes, which impede locomotion and produce stumbling, with its sometimes disastrous consequences. All clothing should be comfortably warm, the lower limbs especially being protected from cold.

Muscular Exercise.—The best exercise for a healthy pregnant woman, even up to the day of her lying-in, is *walking in the open air*. At no period of pregnancy need it be interdicted, if kept within the limit of moderate fatigue. It increases respiration, appetite, and digestion, and promotes sleep. Violent exercise and muscular strain of all kinds, especially lifting, must be avoided. Riding on horseback, on bicycles, and in vehicles without springs over rough roads are injurious; *per contra*, exercise in smoothly running carriages upon level roads is advisable. Much depends upon the woman: one may withstand almost every sort of jolting and rough usage without any ill effect, while another—more nervous, delicate, and excitable—will suffer, even to the extreme of abortion or premature labor, from very slight mechanical disturbances. Use care in all. Railroad and street-car travel may or may not be injurious, as the mechanical jarring is great or small and the woman more or less excitable. They should be avoided during the last few weeks of pregnancy in all cases. No pregnant woman who is subject to sea-sickness should risk ocean travel, and those who suffer in the same way from the swinging of railway carriages should not travel by rail. One great virtue of out-door ex-

ercise is to divert the woman's mind from dwelling upon her comparatively trifling ailments and magnifying them into horrors of infirmity, with a liability to drift into chronic invalidism and hysteria. Let her be persuaded to resist languid lolling upon her couch and seek refreshment and exhilaration in the sun and air, provided, of course, there be no real condition *requiring* rest.

Food.—There is no reason, as a rule, why a *healthy* pregnant woman should make any great change from her ordinary diet. With fresh air, exercise, mental diversion, and freedom from the mechanical pressure of costume, her appetite and digestion may be good during most of her gestation. Moderate morning sickness may interfere with her first daily meal early in pregnancy, and the growth of a large uterus encroach upon the stomach during the later months, but in spite of these drawbacks most women manage to assimilate enough food to gain flesh and improve their general nutrition rather than otherwise. The woman's tastes—her likes and dislikes—may usually be indulged with advantage, at least in so far as they refer to ordinary foods. Wines and alcoholic drinks, together with tea (which constipates) and coffee, should be taken with great moderation, if at all. Ripe fruits of all kinds, and dried fruits—notably *prunes*, of which many pregnant women become fond—are of service in correcting constipation. While milk and chocolate may be taken when desired, the one drink—most important to every function of the body—which many women neglect or refuse to take in sufficient quantity, is common *water*. The habit of *disliking* water may be overcome by a plentiful use of *common salt*, which produces thirst. Late in pregnancy, when there is little space for a full stomach, the meals may be small, but of more frequent repetition.

The skin must be kept clean by *warm* baths (not hot, not cold), taken at least three times a week. Sea-bathing is objectionable, yet some women enjoy it without injury. When, late in gestation, the woman becomes too unwieldy to undertake a bath, the external genitals may be cleansed with tepid water twice daily, and the skin rubbed with a wet towel. During later weeks of pregnancy the nipples should be kept scrupulously clean, free from pressure, and softened by applications of borated vaseline or cocoa-butter.

Sleep is important. If practicable, a pregnant woman should

retire early, occupy a bed by herself, and sleep eight hours or more. While *coitus* after impregnation is a physiological absurdity and ought to be avoided, it will usually occur in spite of any advice to the contrary. Indulgence at times corresponding to the menstrual period is liable to cause abortion in those predisposed to this event. If abstinence be refused, enjoin moderation, and brief instead of prolonged sexual excitement.

Under all circumstances encourage the patient to refrain from anxiety and fear of her approaching travail. Substitute industry and social cheer for indolence and solitary brooding, avoiding always emotional excitement.

Diseases of Pregnancy.—The diseases incident to pregnancy are numerous and varied.

Let it be remembered that most of them are due either, 1st, to *sympathy*—other organs being disturbed in consequence of the tremendous changes going on in the reproductive system; or, 2d, to *pressure*—the mechanical pressure of the gravid uterus upon neighboring parts. Sympathetic disturbances predominate during the earlier months, mechanical disturbances during the later ones.

The opposite blood conditions of *anæmia* and *plethora* also play an important *rôle* in determining the character and treatment of these diseases.

Again, generally speaking, the *nervous system is more susceptible to impressions during pregnancy* than at other times.

Finally, some of the pathological conditions to be studied are simply exaggerations of the physiological phenomena ordinarily numbered with the usual *signs* of pregnancy.

Classification of Diseases.—No classification of the diseases of pregnancy yet devised is perfect; all are arbitrary. For convenience' sake we may group the several affections to be considered (confining the list to those *actually due to pregnancy*) as follows:

1. Diseases of the Digestive Organs:
 - *a*. Salivary glands.
 - *b*. Teeth.
 - *c*. Stomach.
 - *d*. Intestines.
2. Diseases of the Urinary Organs:
 - *a*. Kidneys.
 - *b*. Bladder.

3. Diseases of the Reproductive Organs:
 a. Uterus.
 b. Vagina.
 c. Vulva.
 d. Mammæ.
4. Diseases of the Circulatory Organs:
 a. Heart.
 b. Veins.
 c. Blood changes.
5. Diseases of the Respiratory Organs.
6. Diseases of the Nervous System.
7. Diseases of the Skin.

SALIVATION OF PREGNANCY. *Symptoms.*—A constant dribbling of saliva, day and night, but no offensive breath, as in mercurial salivation. Occurs usually during the early months, but may continue during the whole of pregnancy. It varies greatly in duration as well as in degree. Buccal mucous membrane way be red and tumid; the submaxillary and parotid glands tender and enlarged. The water of the saliva is increased; its solids diminished. Ptyalin may be deficient, and digestion consequently impaired. Occasionally *gingivitis* occurs, the gums being red, swollen, tender, sometimes bleeding on pressure and retracted from the teeth, which become loose, with difficult and painful mastication.

Prognosis is doubtful as to *cure* before delivery, but no serious consequences need be apprehended further than anxiety and annoyance.

Cause.—It is one of the *sympathetic* affections. The sympathy between the salivary glands and the generative system is well known from the phenomena of mumps, coition, etc.

Treatment.—By gentle saline laxatives, which divert the excessive secretion to the intestinal glands, and by astringent mouth-washes of tannin, alum, sulphate of zinc, or potassium chlorate. Counter-irritation by tincture of iodine or small blisters externally, over the parotids. Extract of belladonna (gr. ¼, three times a day), or equivalent doses of atropia, may lessen the discharge. Pilocarpine (gr. $\frac{1}{12}$) and fluid extract of viburnum have been recommended. The following gargle may be used two or three times a day:

℞. Sodii boracis glycerini, f ℥ij;
Aquæ rosæ, vel aquæ, f ℥vj. M.

Bromide of potassium has cured some cases apparently. *Iron* and other tonics, with generous diet, are important. No treatment is reliable.

Dental Caries and Toothache.—That pregnancy actually causes the teeth to decay is a widespread belief among physicians as well as laymen; hence the proverb, "for every child a tooth." It has been ascribed to acidity of the oral secretion from dyspepsia, but quite as likely it is due to malnutrition of the teeth from certain constituents of their composition having been appropriated to nutrition of the embryo.

Treatment.—In recommending operative procedures upon carious teeth during pregnancy, the degree of "nervousness" or emotional susceptibility of the patient, and the severity of the required operation, should enable the physician to judge whether the mental shock or physical suffering to be incurred would be likely to bring on abortion. Conclusion accordingly.

In case no operative procedure is agreed to, a dose of morphia may be administered hypodermically for *immediate* relief of the pain, to be followed by anodynes, and *quinine in full doses,* thus:

℞. Quiniæ sulph. gr. xxx;
Morph. sulph. gr. ss;
Extr. belladonnæ, gr. jss;
Acid. sulph. *aromat.* q. s. ft. pil. vj.
Sig.—Take one every four hours.

Other remedies are: Fld. ext. gelsemium, gtt. iij–v, three times a day, until slight ptosis occurs. Croton-chloral, gr. ij–v, every hour, until not more than fifteen grains are taken.

Externally, warm applications and anodyne liniments (of camphor, aconite, laudanum, chloroform, etc.) may afford relief. Neuralgia of the face (*tic douloureux*) requires the same remedies. Faceache, headache, intercostal neuralgia, and other forms of the same disease, when caused by *anemia*, require *iron*, to which arsenic may be profitably added, as in the following formula from Lusk:

℞. Pulvis ferri, gr. ij;
Arsenic, gr. $\frac{1}{50}$.

To be taken in pill, three times a day, and continued several weeks; or,

Ferri et quiniæ citras, gr. v;
Aquæ, ʒj,

three times daily at meal hours.

Derangements of the Stomach; Excessive Vomiting. *Symptoms.*—Exaggeration of ordinary "morning sickness." Vomiting increased in severity, duration, and frequency. May come on at all times, day and night. Ejected matters contain, successively, food, clear mucus, and regurgitated bile. May be severe pain in the stomach from continued retching; apt to continue weeks, or even months, in spite of treatment; then follow: *constitutional symptoms*, fever, emaciation, restlessness, exhaustion, and, later, fetid breath; dry, brown tongue; feeble and frequent pulse; night-sweats and insomnia. Still later, in the worst cases, vomiting stops (from exhaustion of reflex power of the spinal cord), and nervous symptoms appear, viz., delirium, stupor, coma, and rarely, *very* rarely, death.

Prognosis.—Cases apparently hopeless sometimes "turn a corner," as it were, and end in recovery when it is least expected. The symptoms may stop from sudden mental emotion, or the occurrence of spontaneous abortion; or, again, a new medicine, or some special article of food or drink, may succeed after many others have failed. The gravity of the prognosis increases in proportion to *constitutional* symptoms and failure of general nutrition. It is worse in those cases complicated with some gastric or intestinal disease previous to pregnancy.

Causes.—Most cases of moderate severity may be attributed to reflex nervous derangement, just as vomiting attends diseases of the uterus. Stretching of the uterine muscular fibres by the growing ovum; flexions and versions of the womb; inflammation of the uterus, either of its body or neck—or all of these combined, may constitute etiological factors. Previously existing gastric catarrh, ulcer or cancer, and old intestinal lesions may explain some of the grave cases.

Treatment.—The remedies are "legion." When some fail others must be tried. What will cure one case may be futile in another.

Diet.—Total abstinence from food or drink may be tried for a whole day, or even two or more complete days—a mode of treatment easy of application *early*, not so *later*, when the patient is exhausted.

Liquid diet, in small quantities frequently repeated, in preference to solids, the order of selection as follows:

Milk; milk with soda-water; koumiss.
Iced milk.
Meat soups: either
Beef,
Chicken, } carefully freed from grease.
Mutton,
Well-cooked farinaceous liquids:
Barley-water.
Arrow-root.
Rice-water.
Corn-starch, etc.

Should these fail, and the patient avow a *desire* for bacon and cabbage, pork and beans, onions, green apples, horse-radish, mustard, or any other *apparently* unsuitable article, give it to her as an experiment, and put the slops aside.

Eating ordinary "pop-corn" will sometimes stop it; so will chewing spruce gum.

Ice-cream, cracked ice, ice-water, and water-ices may do good service.

Wake the patient at midnight, or in the early morning hours, and give her (previously prepared) toast and coffee, or an egg, then quickly put out the lights and leave her alone to sleep again. Food thus given may be retained when it would be rejected at other times.

Scraped beef, *lean* and *raw*, spread on *very* thin bread, is worthy of trial.

In cases where no food can be retained and the general nutrition begins to fail, the patient may be sustained, for weeks together, by rectal alimentation alone. Beef-tea and other animal broths, peptonized milk, white of eggs stirred in water, etc., in quantities of four or five ounces, three times a day, may be injected. Tincture of opium, or potassic bromide, or brandy, may be added to the enemata, as circumstances may require. Diarrhœa and rectal intolerance, by preventing retention of the injections, may exclude the use of this treatment.

Medicinal Remedies.—Of the various medicines used, it is impossible to say which will suit any one case. For convenience of recollection they may be arranged into groups, as follows:

1. *Purgatives.*—A brisk cathartic pill, or laxative enemata,

until bowels are freely open (especially if there have been previous constipation), will "work wonders" in relieving emesis.

2. *Reflex Sedatives and Anodynes.*

℞. Potass. bromid. gr. x–xx, in some aromatic water three times a day.
℞. Chloral. hydrat. gr. v (a small dose), given in solution, every two hours.
℞. Pulv. opii, gr. j, given in a single pill with as little fluid as possible. Not to be repeated.

Should the stomach reject all these,

℞. Potass. bromid. ʒj; or
℞. Chloral. hydrat. gr. xx; or
℞. Tinct. opii, fʒss,

may be administered in a nutritive vehicle, *per anum*.

Morphia—preferably the bimeconate—given either hypodermically or endermically (sprinkled on a blistered surface).

Anodyne plasters and liniments, or ether spray, applied over the epigastrium; also counter-irritants, *e. g.*, mustard, cantharidal collodion, or blisters of Spanish fly.

3. *Alkalies.*—Especially suited to cases of acid stomach, heartburn, etc. Give aq. calcis ʒss with ʒss of milk, and repeat every fifteen minutes; or Vichy water; or magnesia with milk; or the aromatic spirits of ammonia (dose xx drops) in ʒj of some aromatic water; or bicarbonate of soda.

4. *Acids.*—Lemon-juice, orange-juice, or the acid. sulphuric. aromatic. (dose x–xx drops) in ʒj of water. Citric acid (*syrup. acidi citrici*, U. S. P., fʒss). Carbonic acid (gas), as in soda-water, or the effervescing draught of the U. S. P., etc. One or two drops of the *dilute* hydrocyanic acid may be added to the latter.

5. *Aromatic Bitter Tonics.*—Tinct. cardamom. co., or tinct. gentian. co., or tinct. cinchon. co., or tinct. rhei dulc. (dose of each about ʒj), or the infusion of calumba with aromatic sulphuric acid.

6. *Intoxicating Drinks.*—Champagne *ad libitum*. French brandy, sherry, whiskey, *kirschwasser*. Either may be tried in sufficient quantities to produce slight intoxication. To be resorted to only after a trial of less objectionable methods of treatment.

7. *Unclassified Remedies.*—Given empirically:

Bismuth subnitrate, dose gr. x–xx, before each meal.
Salicine, gr. v–x, three times a day.
Potass. iodid. gr. v, three times a day.
Oxalate of cerium, gr. v to x, before meals.
Vinum ipecac. gtt. j, every hour.
Creosote, gtt. ij, in aq. calcis ℥ss.
Phosphate of lime, gr. xv–xx, in water, three times a day.
Tinct. iodinii *comp.* gtt. x–xv, diluted, three times a day.
Fowler's solution of arsenic, gtt. j, three times a day.
Tinct. aconit. rad. gtt. ij–iv, three times a day.
Tinct. nucis vom. gtt. x, three or four times daily.
Muriate of cocaine—three per cent. solution—dose gtt. x–xx.
Pyroxylic spirit, gtt. x, largely diluted, t. i. d.

Still other remedies may be necessary, as the restoration of a displaced or flexed uterus and its support by a pessary; in cases of inflamed cervix uteri (or even when no such inflammation exists) pour a ten per cent. solution of argentic nitrate through a glass speculum into the vagina until the vaginal portion of the cervix is completely submerged; let it remain ten or fifteen minutes, then decant it: to be repeated two or three times, at intervals of a few days. Relief is sometimes obtained by applying anodynes to the cervix and vault of the vagina: a fifteen per cent. solution of muriate of cocaine, or the extract of belladonna, or Battley's sedative, may be thus applied with a probe and cotton wool, or camel-hair brush. Dilatation of the os and cervix uteri with the finger will sometimes afford immediate relief, but care must be taken not to produce abortion in this way unintentionally.

A bag of cracked ice applied to the cervical or dorsal vertebræ for half an hour, two or three times a day, will sometimes stop the vomiting. Pencilling the fauces with a ten per cent. solution of muriate of cocaine has been lately suggested.

The (at best, unphysiological) practice of coition during pregnancy is probably one of the causes of this vomiting, and should be interdicted.

Should all means of relief fail and constitutional symptoms of a grave character arise, the last resort may be adopted, viz., the induction of abortion or premature labor; but the cases requiring it are *very rare*, and it is not to be employed without a consultation of two or more physicians.

The best means of inducing abortion in these cases is by dilating the cervix uteri; but as moderate dilatation with the finger, as just stated, will often stop the vomiting, this should *first* be done, when, if the vomiting cease, further dilatation to produce abortion will be unnecessary. This mode of arresting vomiting was discovered accidentally by Dr. Copeman. The method bears his name.

DERANGEMENT OF THE INTESTINE.—Constipation is very common. Less often diarrhœa occurs. *Constipation* is a sympathetic affection during the early months, and due to pressure of the enlarged womb during the later ones.

Treatment.—During the early months *mild* saline laxatives, taken largely diluted before breakfast. After their action instruct the patient to visit the closet *daily* at a regular hour, and use gentle *massage* of the abdomen while there. Oatmeal porridge, and brown bread, bran bread, or cornmeal bread. Cool water to be drunk every morning before breakfast, and again the last thing at night. Grocer's figs, dates, prunes, or tamarinds at night before drinking the water. Forbid tea.

During the later months, when masses of scybala are liable to accumulate, castor oil with tinct. opii may be given, and injections (daily if required, at a regular hour) of soap and water; or hot water and glycerin, equal parts; or rectal suppositories of pure glycerin.

Should stronger medicines be necessary, either early or late, manna may be given, or extract of colocynth with extract of belladonna, or an occasional blue pill with soap and asafœtida; or a teaspoonful of compound liquorice powder at night; or ℞. Ext. colocynth. co. gr. ij, pulv. rhei, gr. j, ext. belladonnæ, gr. $\frac{1}{4}$, ext. hyoscyami, gr. ss, in pill, at bedtime; or ℞. aloin, gr. $\frac{1}{4}$, strychnia, gr. $\frac{1}{60}$, ipecac. gr. $\frac{1}{10}$, ext. belladonna, gr. $\frac{1}{8}$, in pill, at night.

Impacted fecal masses sometimes require removal by mechanical means and solvent enemata.

For chronic constipation direct massage in the closet, thus: When seated, let the patient place her arms "akimbo," the thumbs directed backward and plunged into the space on each side of the lumbar spine below the ribs, while the hands are spread out below the ribs laterally, and so moved about in a circle round the body, the ends of the thumbs and fingers making intermittent pressure.

Diarrhœa.—If it have been preceded by constipation, and the evacuations contain but little fecal matter, and consist chiefly of mucus, give a gentle laxative of castor oil and laudanum, or a dose of solution of citrate of magnesia to cleanse the bowel.

After being sure that no accumulation in the bowel remains, and in cases where none originally existed, give vegetable astringents with opiates, *ex. gr.*, the tinctures of kino, catechu, or krameria (dose of either ʒ j), with tinct. opii gtt. x, in ʒss of mist. cretæ, three times a day. Or pills containing acetate of lead, opium, and ipecac may be prescribed, or syrup of rhubarb with bicarbonate of soda.

In addition enjoin muscular rest and the recumbent posture; mustard, followed by warm cataplasms to the abdomen, and milk diet with well-cooked rice-flour, arrowroot, or cornstarch, etc.

The occurrence of diarrhœa during pregnancy must not be neglected. Unless checked, it may lead to abortion or premature delivery. It should be treated with great care, especially if accompanied with tenesmus or other signs of enteritis.

Diseases of the Kidney and Bladder. Albuminuria.—The frequency with which albumen occurs in the urine of pregnant women has been variously estimated at from two to twenty per cent.

It may exist when slight in degree, and especially if only during the later months, without any marked ill health, or without being suspected unless the urine be tested; but in other cases, where the quantity of albumen is great and begins to appear early in the pregnancy, the prognosis may be of the gravest character.

Etiology and Pathology.—Nothing is more unsettled than the causes and pathology of the renal troubles of pregnancy.

Albuminuria is only a *symptom*, which may or may not be attended with structural lesion of the kidney. All known lesions of the kidney—every variety of nephritis—may occur in pregnant women *as in other persons*. In some women renal disease is present when gestation begins. While some cases are thus accounted for, there are others in which renal disease only begins during pregnancy and disappears after delivery. It is these last that are difficult to explain. That the morbid

conditions observed are in some way produced by pregnancy cannot be doubted, and that previously existing renal disease is made worse by gestation is equally true. Theoretical explanations that explain some cases fail to explain others. The etiological factors probably vary in kind and number in different cases. Some of these factors (the relative potency and frequency of which it is difficult to define) are as follows:

1. Obstruction to the ureters owing to their being "stretched, flexed, distorted, or compressed" by the gravid uterus.
2. Sudden hyperæmia of the kidneys, produced by cold and consequent suppression of perspiration.
3. Increased functional activity of the kidneys, required during pregnancy to excrete waste products of the fœtus.
4. Increased blood pressure in vessels of kidney from general arterial tension throughout the body, owing to cardiac hypertrophy (physiological hypertrophy of left ventricle) incident to pregnancy.
5. Mechanical pressure of the gravid uterus upon blood-vessels—either veins, arteries, or both—so as to disturb the renal circulation.
6. General increase in intra-abdominal pressure owing to tension produced by expanding pregnant uterus, and producing venous stasis in the kidneys.
7. Reflex vasomotor spasm of the renal arteries (and consequent renal anæmia) originating peripherally from the uterus.
8. The alleged hydræmic condition of the blood incident to pregnancy.
9. Anomalous distribution of large bloodvessels in the abdominal cavity, such ectopic bloodvessels being more liable to mechanical pressure by gravid uterus than vessels normally distributed.

None of these views have been conclusively proved; most probably a plurality of etiological factors act conjointly.

The lesions of the kidney vary, depending largely upon the existence or non-existence of structural changes prior to gestation. The evidences of nephritis, acute or chronic, interstitial or parenchymatous, may or may not be present.

Symptoms and Diagnosis.—The urine of every pregnant woman should be examined at short intervals, especially late in pregnancy, both chemically and microscopically, for evidences of kidney disease. Albumin is detected by *boiling* the urine, which coagulates the albumin, as does also nitric acid;

but heat will give a precipitate resembling that of albumin if phosphates be present; this, however, is immediately redissolved by nitric acid. The amount of albuminous precipitate may vary from a barely perceptible opalescence to apparent complete solidification. Albumin is not always continuously present: it may be absent one day and appear the next, or *vice versa*—hence the examination should be repeated.

The *quantity* of urine passed in twenty-four hours should be collected and measured, and the total amount of *urea* it contains be approximately ascertained. This can be conveniently done by using the ureometer of Prof. Doremus with the sodic hypobromite solution, which gives the grains of urea in each ounce of urine. The total quantity of urea excreted daily should not be less than 400 or 500 grains.

Examined microscopically the urine exhibits renal epithelium cells, tube-casts—either hyaline, epithelial, or fatty—and perhaps red blood-corpuscles, the presence, number, or absence of these elements varying with the kind and stage of kidney lesion. Casts may be present without albumin, and *vice versa*.

Should albumin appear early in pregnancy, and in sufficient quantity to constitute a serious case, the following symptoms may be successively anticipated:

Anasarca, beginning usually in the lower limbs, but if the kidneys be seriously implicated dropsical puffiness of the face and hands may occur *first;* it may extend over the entire body and also to the serous cavities.

The urine becomes *high-colored* (dark, or smoky-brown, from admixture with blood), diminished in *quantity*, or it may be partially or suddenly and completely *suppressed*. What little is obtained is composed largely of albumin and shows an abundance of tube-casts, blood-corpuscles, etc., under the microscope.

Nervous symptoms.—The kidneys failing in their function, urea begins to accumulate in the blood and poison the nerve centres; hence occur headache, vertigo, nausea, vomiting, and epigastric pain; derangement of special senses—impaired sight, hearing, etc.; the breath and perspiration may have an ammoniacal, urinous odor. Unless relieved, these symptoms terminate in

Uræmic convulsions (so-called "eclampsia," spasms); followed by stupor, going on to complete coma, perhaps death. (For phenomena of eclampsia, see Chapter XXXIII.)

Premature delivery may occur, or if the case reach full term convulsions may be looked for during labor.

After delivery the convulsions may cease and the patient recover; or, after partial recovery, the woman may die later from chronic Bright's disease; or remain more or less disabled from paralysis or mental derangement.

Prognosis.—Conditions rendering labor difficult; the abundant occurrence of tube-casts and extensive dropsy, especially of the face and hands *early* in pregnancy; together with indications of uræmia—all augur unfavorably.

The *late* appearance of symptoms, dropsy confined to the lower extremities, uræmic symptoms not impending, and the probabilities of an easy labor, augur less danger, especially if the albumin be small in quantity and tube-casts are wanting, or few in number, and the urine is not suppressed.

Treatment.—Purgatives to produce watery stools and thus promote excretion from the bowels to relieve the disabled kidneys. Give pulv. jalap. co. ʒss; or calomel and jalap, of each ten grains; and keep up a free action of the bowels with a daily pill containing extract of aloes and extract of colocynth, of each three-quarters of a grain, taken in the morning. In bad cases with symptoms of impending uræmia, elaterium may be given, but with care to avoid exhaustion and production of premature labor by its drastic effects.

℞. Triturat. elaterini, gr. ss.
Extr. hyoscyam, gr. j.
Ol. caryophylli, gt. j. M.
Sig.—For one dose.

Of equal importance with purgation is promotion of the secretion of the *skin*, preferably by the hot water or vapor bath. Submerge the patient, all but the head, in bath-tub of hot water—102° F.—covered with a blanket. Let her so remain thirty minutes, the temperature of the water being gradually increased to 110° F. On removal from the bath wrap the patient in a hot sheet, place her in bed between thick woollen blankets, and covered up all but the face. During the bath cold wet cloths may be applied to the head to relieve headache, etc.; water drank freely to promote diaphoresis, and a glass of wine given if faintness occur. Guard against exposure while cooling off, rising from bed, and dressing. Bath may be repeated once or twice daily. It has one draw-

back, viz.: the liability to bring on uterine contraction and labor. Chloral and the bromides may prevent this.

When the water-bath is not available use the *hot-air bath*, thus: place a spirit lamp on the floor near the bed; over it arrange a large tin funnel, the long bent beak of which, placed beneath the bedclothes, conducts the hot air to the space occupied by the patient. It may be continued half an hour, and repeated daily.

The use of jaborandi and pilocarpine as diaphoretics is not advisable, from their liability to depress the heart's action, produce pulmonary œdema, and bring on labor.

Lessen congestion of the kidneys and promote their secretion by extensive dry cupping with tumbler glasses, or large cups, over the loins, followed by the application of sinapisms to the same part, and then hot poultices constantly applied.

The woman may be placed in the knee-chest posture or in the Sims position, to reduce the pressure of the gravid uterus and throw its weight forward toward the abdominal wall and away from the pelvic brim.

Diuretics: give Vichy, Poland, or Buffalo lithia water freely,[1] or the citrate of lithia in 5-grain doses with infusion of digitalis, or, more conveniently, the lithia salt may be dissolved in water, each dose containing one or two drops of *fluid extract* of digitalis—more reliable than the *tincture*.

The *diet* should be chiefly, and in bad cases exclusively, *milk*. Milk is itself a *diuretic*; it is easily assimilated and leaves little unabsorbed *débris* in the intestine. Solid food—especially meat—to be forbidden.

Recently the subcutaneous infusion of common salt solution—the so-called "normal salt solution"—in quantities of a pint or two, at once, into the connective tissue of the nates or abdominal wall, has been successfully used as a *diuretic*. It is harmless and easy of application.

Observe that, however the means may differ, the object of treatment is always the same, viz.: *restore the function of the kidneys*, or aid them by increased elimination through the *bowels* and *skin*.

[1] The salts of *potash*, recommended in former editions of this work, are now considered to exert a toxic influence, and are therefore omitted.

[2] Prepared by putting 100 grains (approximately one teaspoonful) of common salt in a quart of water and boiling for five minutes; more exactly, 3 grains of salt to one fluidounce of water, which makes a six-tenths of 1 per cent. solution.

The treatment must be modified according as the patient is anæmic or plethoric. If anæmic, give iron—the tinct. fer. chlo. with tr. digitalis; or the liq. ferri et ammonii acetatis (Basham's mixture), ℥ss, to each dose of which one or two drops of *fluid extract* of digitalis may be added. If plethoric, wet cupping over kidneys.

Under the supposition that retained urea breaks up into ammonium carbonate, benzoic acid has been given with a view to produce an innocuous ammonium benzoate. It is of doubtful efficacy. Dose, five to ten grains, three or four times a day, in solution.

Should the symptoms grow worse in spite of treatment, and involvement of the nervous centres be indicated by disordered senses, convulsions, etc., *premature delivery*, if it do not take place spontaneously (which is not unusual), may be induced. (See Chapter XXIII.)

Convulsions occurring during labor—whether the latter be premature or otherwise—and whether spontaneous or induced, as a rule, call for speedy delivery and the administration of chloral, morphia, anæsthetics, etc., as set down in Chapter XXXIII.

Diabetes. (Melituria. Glycosuria.)—Sugar may be found in the urine of pregnant women without any symptoms of ill health, and disappear after delivery, or after lactation. This so-called "physiological glycosuria" is of frequent occurrence. Again, women who are already the subject of diabetes may become pregnant, and the pregnancy go on to term without any necessary apparent interference.

But diabetes complicating pregnancy may be serious, or even fatal to both mother and child. These cases are very rare, especially so in primiparæ. The child sometimes dies before birth (during the latter months of pregnancy), or soon afterward. The maternal deaths, thus far noted, have occurred after delivery or premature labor.

Diagnosis.—Detect sugar by chemical tests (Trommer's, Fehling's, Moore's, etc.). The womb may be over-large from dropsy of the amnion, or from the child being enormous in size, owing to dropsical infiltration. Liability to abortion or premature delivery. Pruritus of the vulva is apt to occur.

Treatment.—The dietetic and medicinal means employed for diabetes without pregnancy. Should these fail, the question

of inducing premature labor must be considered as a last resort.

Bladder.—Irritability of this organ is indicated by frequent desire to micturate. It occurs as a sympathetic affection during the *early* months, causing distress and sometimes disturbing rest at night. May also be produced by prolapse of the uterus during the first three months, relief spontaneously occurring as the womb rises during the fourth month. The worst cases, accompanied sometimes by serious cystitis, are commonly due to retroversion of the uterus. In any case of irritable bladder it is important to know whether the trouble be purely nervous, or, on the contrary, due to cystitis. The urine tells: in purely functional cases it is clear; in cystitis, clouded with mucus or pus, which may be detected with the microscope or observed in visible strings or masses when the urine, after settling, is poured from one vessel to another. The possibility of gonorrhœa should be remembered. In cystitis the bladder is sensitive to abdominal pressure.

Late in pregnancy irritable bladder occurs from pressure of enlarged womb, especially when the child's head is large from hydrocephalus. Cross-presentations sometimes drag the bladder out of place and produce functional irritability of the organ, to be relieved by abdominal palpation restoring the child to its normal position.

Treatment.—In nervous or functional cases, without cystitis, rectal suppositories of morphia and atropia at night to secure rest. The following is an efficient and convenient remedy:

℞. Ext. buchu fld.
Tinct. opii camph. āā f ℥j. M.
Sig.—Teaspoonful (or more) every two or three hours.

Give bland mucilaginous drinks (flaxseed tea, slippery elm, etc.), infusions of uva ursi, or triticum repens, combined (if the urine be over-acid), with liq. potassa or potass. bicarb. Balsam copaiba and tinct. belladonna internally may be tried.

In cystitis, besides the foregoing remedies, the cavity of the bladder should be daily washed out with some warm antiseptic solution, viz., creolin, 10 drops to a pint of water; or either thymol, salicylic acid, or potass. permanganate, in the proportion of 1 to 1000 of water, or boric acid, 40 to 1000.

In all cases be sure the bladder completely empties itself.

If necessary, use male elastic catheter. Restore the uterus if displaced. The knee-elbow position may enable the patient to empty the bladder. When the womb inclines forward, pressing upon the bladder, push back and support it with wide abdominal bandage. Keep the bowels free from accumulation, thus leaving more room for the uterus and bladder.

INCONTINENCE OF URINE.—The urine dribbles away in elderly women who have had many children. Treatment: the abdominal belt, tinct. cantharadis, gtt. v in ℥j of flax-seed-tea, three times daily. Frequent ablutions and simple ointments are required to prevent or relieve excoriations of the skin. Small and frequent discharges of urine are often associated with over-distention of the bladder and paralysis of its walls. When this is suspected, examine for bladder tumor above pubes and use catheter.

Involuntary discharges of urine during coughing, laughing, sneezing, etc., may be relieved by tr. fer. chlorid., tr. nucis vom., or tr. belladonnæ.

AFFECTIONS OF THE REPRODUCTIVE ORGANS. PROLAPSUS UTERI (FALLING OF THE WOMB) DURING PREGNANCY.—It usually rights itself when the womb rises during the third or fourth month, but, failing in this, the condition may become serious from the growing uterus getting jammed between the bony walls of the pelvis and pressing upon the bladder and rectum, or leading to abortion.

Treatment.—Rest in the recumbent posture, with the hips elevated on pillows, pushing up the uterus by gentle manipulation, and, if imperatively necessary to keep it there, pessaries. Continue treatment until uterus gets large enough to remain above the pelvic brim. Should impaction occur and obstruct discharge of rectum or bladder, the induction of abortion may become a necessary resort to save the woman's life.

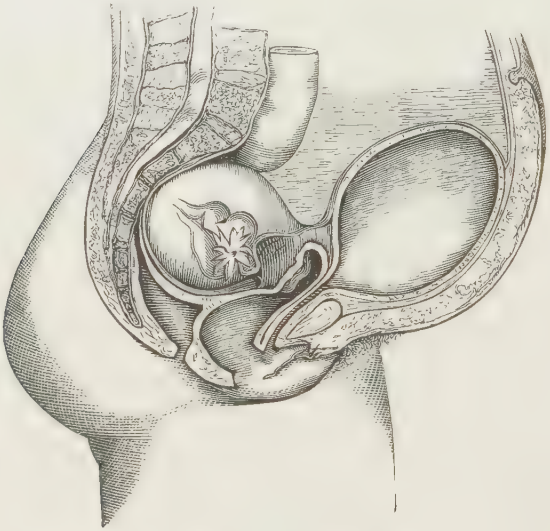
RETROVERSION OF UTERUS.—The fundus of the organ falls over backward, while the cervix is tilted upward and forward, toward or over the pubes.

Symptoms.—Pain in the back, numbness or pricking or unsteadiness in the lower limbs, and difficult or very painful defecation and micturition. The diagnosis is made on finding the fundus uteri in its malposition by a digital examination

per vaginam, while the os and neck are tilted high up toward the pubes.

Prognosis.—Usually favorable from gradual spontaneous replacement as the womb increases in size, but serious or fatal consequences may arise from impaction of the growing organ (as in prolapsus) if it be not replaced during the earlier months.

Fig. 61.



Retroversion at about twelfth week.

Ulceration and sloughing of the bladder may occur from prolonged retention of urine; and obstruction of the bowel may cause absorption of poisons from the intestine and consequent toxæmia.

Treatment must not be delayed. Empty the bladder by a male elastic catheter. If this be impossible, aspirate the bladder. Empty the rectum. Place the woman in the knee-elbow position, and restore the organ by gentle digital pressure either by vagina or rectum, or both conjointly.

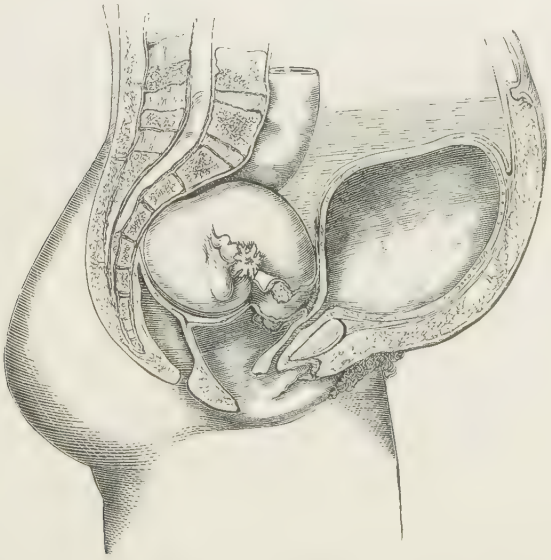
Should manipulation fail, make gentle, prolonged pressure by distending a soft-rubber bag in the vagina, or a Barnes'

dilator in the rectum, the pressure thus induced being kept up for several hours. After replacement a Hodge pessary may be required to retain the womb in its normal position, or tampons of antiseptic cotton placed behind the cervix in the posterior vaginal fornix may be used for that purpose

Should all means fail to get the fundus above the sacral promontory, abortion or premature delivery may be required to save the woman's life.

Fig. 61, p. 152, from Leishman (after Schultze), shows retroversion of gravid womb at about twelfth week, with retention of urine and enormous distention of bladder, owing to the urethra being dragged up and compressed by the displaced cervix uteri.

FIG. 62.



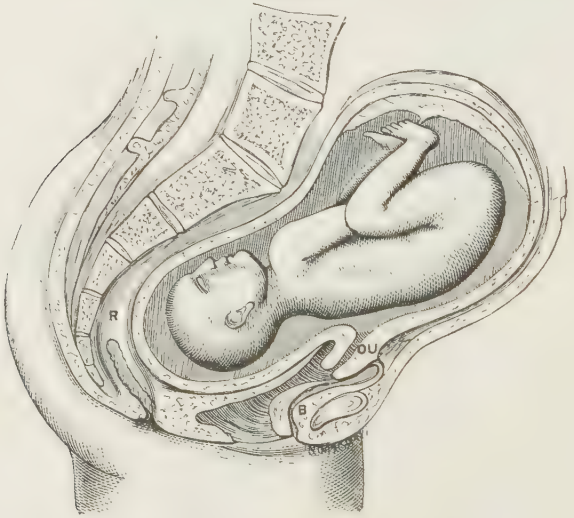
Retro-*flexion* of gravid uterus—sixteenth week. (SCHULTZE.)

Retroversion of the uterus is frequently associated with some degree of retro-*flexion*—a bending of the axis of the womb, in which the os externum and vaginal portion of the cervix appear to maintain their normal position, while the fundus is bent backward toward the sacrum (Fig. 62); but

the disastrous results are the same as in simple retroversion: so is the treatment.

In the case of retroflexion it occasionally happens that the womb becomes dilated into a sort of double sac, one pouch of it being above and the other below the pelvic brim, as shown in Fig. 63, from Dr. Barnes' work. Impaction, and dangerous pressure upon bladder, etc., in the pelvic cavity, are thus relieved. *Both* pouches may also arise above the brim spontaneously as pregnancy proceeds, and the gestation reach

FIG. 63.



Bisacculated uterus—incomplete retroflexion.
R. Rectum. OU. Os uteri. B. Urethra and bladder.

full term; or, the lower pouch remaining in the pelvic cavity, full term may still be attained, but delivery is impossible, owing to displacement of the os above pubes, and occupation of the pelvic cavity by the lower pouch, unless the latter be pushed up by manual pressure *per vaginam* and the os uteri brought down, which is the proper treatment, during both pregnancy and labor. Should this method fail, the last resort is vaginal hysterotomy and extraction of the child through the incision.

Anteversion of Uterus.—Since the anterior pelvic wall is only one-third as deep as the posterior one, there is far less difficulty in the fundus uteri getting above the brim when it is displaced anteriorly (anteversion) than when retroversion occurs. But when *above* the brim the womb may still remain anteverted and press upon the bladder, as occurs chiefly in deformed women (pelvic deformity), or in cases of ventral hernia, or in those whose abdominal walls have become relaxed and pendulous from frequent childbearing.

Treatment.—Rest on the back; abdominal support to the flabby belly by a wide bandage; and a catheter (male elastic always during pregnancy) if necessary to empty the bladder.

Anteflexion of the womb—*bending* of the uterus so that the fundus and body are curved forward toward the bladder and pubes—may or may not be associated with anteversion, just described. It is apt to occur in women whose uteri were anteflexed before pregnancy began. *Rarely* the fundus *may* become locked behind the pubes, but it is far more easily replaced than retroflexion, the pubic bones offering no projecting promontory like that of the sacrum.

The *symptoms* are: irritable bladder, frequent micturition, increased by walking and sitting, mitigated by recumbency. Vomiting excessive and troublesome. Pain in the hypogastric region or pelvic cavity. Abortion may occur, if the organ do not right itself. Vaginal examination reveals the os uteri far back, and the fundus, as a hard tumor, felt through anterior vaginal wall.

Treatment.—Rest in bed on the back. Replace the womb by digital pressure *per vaginam*, or by elastic bag as for retroversion cases. A pessary may, rarely, be required to maintain the womb in its restored position.

Leucorrhœa, or "Whites."—It consists of an excessive discharge of mucus from the vaginal canal. It is liable to irritate the vulva and produce itching and excoriation. Condylomata may exist, or granular papillary projections constituting granular vaginitis. Generally the disease is simply a hypersecretion, due to congestion of the vaginal wall or cervix uteri. It may be due to gonorrhœa or to endo-cervicitis.

Treatment.—Avoid the use of injections for fear of producing abortion. Frequent tepid emollient ablutions are indis-

pensable for cleanliness, and to prevent excoriations, etc. Laxatives to prevent constipation. If the discharge be sufficiently profuse to *require* moderating by astringent, use vaginal suppositories of tannin, alum, etc.

℞. Acid. tannic. ʒj;
Ol. theobrom. q. s.
Fiat suppos. no. vi. Use one twice daily.

A muslin bag, large enough to contain twenty grains each of alum and bismuth subnitrate, may be introduced dry into the upper part of the vagina, and withdrawn by its attached string after twelve hours.

In gonorrhœal cases apply a 2 per cent. solution of argentic nitrate to *every part* of vaginal mucous membrane, with brush, through speculum, daily. Keep the parts clean with mild bichloride of mercury lotion.

Pruritus Vulvæ.—Intense itching of the vulva is of frequent occurrence during pregnancy. There is an irresistible desire to rub the parts, sometimes even during sleep, which may lead to excoriation, scabbing, ulceration, etc. Itching may extend over thighs, abdomen, and other parts of the body.

Treatment.—Frequent tepid emollient ablutions. Dust the vulva afterward with starch powder four parts, to pulv. camphor one part; or powdered zinci oxid. Other remedies are: a solution of corrosive sublimate gr. ij, to water ℥j; solution of sodæ borat. ℥j, to water one pint; infusion of tobacco (ʒss, to water one pint); application of essence of peppermint with a camel-hair brush; or a lotion containing borax ʒij, oil of peppermint gtt. vj, to hot water one pint; sulpho-carbolate of zinc ℥j, to water one pint; carbolic acid gtt. x, with glycerin and water, of each ℥ss; and dilute hydrocyanic acid ʒss, with acetate of lead ℈ij, to water one pint. Paint the parts with a four per cent. solution of hydrochlorate of cocaine. The following ointment may be serviceable:

℞. Camphoræ, Chloral hydrat., āā ʒj;
Ungt. aquæ rosæ, ℥ij. M.

If ulcers exist, remove scabs by warm poultices, then apply nitrate of silver gr. xx, to water ℥j, to be followed by calomel ointment (ʒj of calomel to ℥j of vaseline).

Painful Mammary Glands.—Breasts are the seat of pain of a neuralgic character, due to rapid development. In plethoric women relief may be obtained by the derivative effect of saline laxatives. In anæmic, sensitive, nervous women give iron, quinine, wine, and good food. In either case application of belladonna ointment, or the tincture sprinkled on a bread poultice, or anodyne liniments of olive oil, camphor, and laudanum, will afford relief.

Diseases of the Blood and Circulatory Organs.—Palpitation of the Heart may occur either sympathetically during the early months, or later from encroachment of the enlarged uterus pushing up the diaphragm, and embarrassing the heart's action.

Treatment.—The sympathetic trouble is usually associated with nervous debility due to anæmia, and therefore requires iron, quinine, good diet, including raw onions, and a little wine. A plaster of belladonna over the cardiac region. Direct relief may be obtained, temporarily, by asafœtida, hyoscyamus, and other antispasmodics.

The opposite state of plethora *may* exist, when rest, laxatives, low diet, and, perhaps, bloodletting will be required.

For the mechanical embarrassments of the later months, little can be done further than palliation by antispasmodics and attention to the general health and excretory functions; but the patient may be consoled with the assurance of relief when the womb sinks down prior to delivery. Temporary ease may be attained by belladonna plasters over the præcordium.

Syncope, or Fainting.—The attacks may recur several times a day. The pulse is feeble, pupils dilated, consciousness partly lost, and there may be hysterical phenomena.

Treatment.—Recumbency with the head low, the application of ammonia to the nostrils, and diffusible stimulants, valerian, etc., during the attacks. In the intervals, iron, food, and bitter tonics. Bromide of potassium gr. xx three times a day. Remove corsets, tight-fitting clothes, and *all* belts, waist-strings, and belly-bands. Avoid crowded rooms and impure air.

Anæmia.—The *exact* blood-changes of pregnancy that occur *normally* are still unsettled, but the tendency generally is

toward *anæmia*, which may become so pronounced as to require treatment. It is most apt to occur during the later months, when the red corpuscles and albumen of the blood are diminished and its fibrin increased. A few *fatal* cases have been recorded. The *symptoms* are those common to anæmia in other cases: pallor, loss of appetite, feeble and frequent pulse, weakness, and fatigue after slight exertion, nervousness, emotional excitability, palpitation, neuralgia, etc. In some cases there occur: vertigo, tinnitus aurium, flushed face, fulness or weight in the head, and somnolence, which might, without care, be mistaken for symptoms of plethora. In other instances the blood becomes so thin and *watery* as to constitute a veritable *hydræmia*, when œdema and dropsy may occur, beginning in the feet and extending successively upward to the legs, thighs, vulva, vagina, and uterus. The labia may become enormous in size, the œdematous distention even leading to gangrene.

Treatment.—Iron, the quantity of which in the blood, owing to loss of red blood-corpuscles, is diminished, as proved by analysis. Precede the administration of iron by laxatives, tepid baths, sunshine, pure air, and outdoor exercise, to prepare the system for its reception. Iron is often not well borne by pregnant women. Its solid preparations—the carbonate, the iron by hydrogen, or the ferrum redactum—are preferable. They may be combined with bitter tonics—the solid extracts of cinchona, gentian, etc.—or with laxatives—rhubarb or aloes; and with quinine or arsenic, or nux vomica. Give a *meat* diet—lean, underdone beef, or scraped lean, *raw* beef; together with milk, or beef tea, eggs, and some red wine or bitter beer. In *hydræmic* cases the œdematous labia may require small punctures to let out the fluid and relieve distention (always with antiseptic dressings), and recumbency, or elevation of the lower extremities.

Plethora.—Plethora during pregnancy is rare; it may, however, occur, or simply constitute the continuance or increase of a pre-existing plethora. The *symptoms* are opposite to those of anæmia, except with regard to headache, giddiness, flushing of the face, and ringing in the ears, which may occur in both; but the general appearance of the female, together with, in plethora, the strength, fulness, and slowness of her pulse, will render diagnosis easy. Many plethoric

women present a previous history of profuse menstruation. Uterine hemorrhage during gestation, and consequently abortion or premature labor, may occur, unless relief be afforded.

Treatment.—Saline laxatives to produce watery evacuations and thus lessen vascular tension; or a more decided cathartic to begin with. Avoid animal food—meats, eggs, milk, as also highly seasoned dishes, condiments, and stimulants. Restrict the *quantity* of food, and let it consist chiefly of vegetables, light soups, and cooling drinks. *Immediate* relief may be afforded by bleeding, even though the quantity of blood taken be quite moderate. Leeches or cupping will be preferable when, coupled with general plethora, there is local hyperæmia of some particular organ, as the brain, kidneys, or uterus. Sexual excitement and coitus must be prohibited.

Varicose Veins, Hemorrhoids, Thrombus, etc.—Pressure of the uterus upon the large venous trunks causes distention and varicose dilatation of the venous branches below them. Hence œdema and varicose veins of the legs, hemorrhoids, dilatation and rupture of the veins of the vagina and vulva, with external bleeding, or formation of thrombi.

Treatment.—Rest in the recumbent position, support of the uterus by abdominal bandages, support of the veins of the legs by elastic stockings, or well-applied roller bandages. Rupture of a varicose vein may occasion fatal bleeding; hence supply the patient with compress and bandage, and teach her how to use them in case of need.

Hemorrhoids require, in addition, laxatives to correct constipation, cool-water enemas before stools, and the avoidance of all straining efforts. Cold ablutions to the anus, followed by astringent ointment, *ex. gr.*:

℞. Ung. gallæ,
Ung. stramonii, } āā ℥j. M.

Sig.—Apply to anus, inserting some within the sphincter.

The Ungt. Gallæ c. Opio (B. P.) may be used in the same way with excellent effect. Suppositories, each containing iodoform grs. v, ext. belladonna gr. ss, glycerine ℥j, are both soothing and laxative. The confection of sulphur is a good laxative in these cases, and, contrary to former experience, aloes has been found beneficial, as in the followng formula by Dr. Fordyce Barker:

℞. Pulv. aloes soc., } āā ℈j;
Sapo. cast. }
Ext. hyoscyami. ℥ss;
Pulv. ipecac. gr. v. M.
Ft. pil. no. xx.
Sig.—Take one night and morning.

Tumefaction of the vulva or vagina, if small, may be left to nature for absorption to take place. If large, causing pressure on surrounding parts and threatening rupture, the only treatment is free incision and careful removal of the contained clots, followed by antiseptic washing, cleanliness, rest, styptic applications if necessary to prevent the recurrence at future or stop existing hemorrhage. The prognosis in such cases is doubtful.

Diseases of the Respiratory Organs.—These comprise, chiefly, functional disturbance of the respiratory acts, manifested by two symptoms, viz., cough and dyspnœa. The acute and chronic organic diseases, pneumonia, pleurisy, etc., occurring only, but not as a result of pregnancy, may be excluded from simple functional disturbances by the absence of their characteristic physical signs.

Cough and dyspnœa occur during the early months as nervous or sympathetic troubles, which they require anodyne and palliative remedies, counter-irritation by sinapisms, reflex sedatives—notably the bromides—and antispasmodics—as valerian, camphor, morphia, dilute hydrocyanic acid, etc.—as in the following combination:

℞. Elix. ammon. valerianat. f℥ij;
Spts. ætheris nitrosi. f℥ij;
Liq. morph. sulph. f℥ss;
Acid. hydrocyanic. *dilut.* gtt. xij;
Aquæ camph. ad f℥iij. M.
Sig.—Tablespoonful every four hours, until relieved.

During the later months cough and dyspnœa result from the enlarged uterus encroaching upward upon the diaphragm, thus interfering with a deep inspiration, hence the breathing is shallow, frequent, and unsatisfying. This is most observable where the womb is very large, from twins, dropsy of the amnion, etc. Treatment by palliatives, as in the sympathetic cases, but with little assurance of success until the womb

sinks down before delivery, when we may anticipate spontaneous relief. Laxatives mitigate the suffering.

Nervous Diseases.—Exaggerations of the mental and emotional phenomena already referred to as signs of pregnancy may occur. They lead us to apprehend insanity. The time of their most frequent occurrence is from the third to the seventh month.

Treatment consists in the promotion of *sleep* by bromides and chloral hydrate; laxatives; moderate exercise, cheerful society, and change of scene; together with attention to diet, and the proper digestion and assimilation of food.

Chorea during pregnancy is rare. It occurs chiefly in those who have previously suffered from the disease, and mostly in primiparæ. Its causes (admittedly obscure) embrace hereditary predisposition, the heart lesions of rheumatism and consequent embolic processes; anæmia, fear, sorrow, anxiety, and peripheral sexual irritation. It is apt to begin coincidentally with the early fœtal movements. It is a serious complication, sometimes ending in insanity, premature labor, and, in about one-third of the cases, death. The child is sometimes affected with the disease.

Treatment.—The bromides and chloral to produce sleep and lessen the movements. Mental quietude; rest; avoidance of excitement; changes of scene and pleasant surroundings. Arsenic, iron, and bitter tonics. Sodium salicylate in rheumatic cases. As a last resort induction of premature labor or abortion. Prior to the latter proceeding moderate digital dilatation of the os uteri is worthy of trial.

Sciatica.—Pain in the pelvis, shooting down the thigh, sometimes accompanied with cramp, and tenderness on pressure over the sciatic nerve, are usually due to constipation and pressure of hard fecal accumulation. May also occur from uterine displacement—notably retroversion—and from the pressure of a large and heavy child.

Treatment.—Laxatives internally, and large rectal injections containing castor oil, turpentine, soap, and glycerine, until the bowel is completely empty. Subsequently, glycerine suppositories and the remedies previously recommended for

constipation (see page 143). A displaced uterus must be replaced and retained in position (see page 152). The pressure of a large child can only be mitigated by the latero-prone posture, and loose clothing, together with anodynes.

Paralysis (hemiplegia, paraplegia, facial palsy, or paralysis of the organs of the special senses) occasionally occurs.

Determine by urinary analysis whether or not the symptoms are due to the retention of urea or the presence of some other toxic agent in the blood. If so the main element of treatment will be by increased elimination—purgatives, diaphoretics, diuretics, etc. These failing, the question of inducing premature labor must be considered.

General Idiopathic Pruritus.—A distressing and sometimes exhausting nervous trouble is a general itching of the skin, without any visible lesion or eruption. In very nervous women it may lead to abortion. Is apt to be worse at times corresponding to menstrual periods. While difficult of cure, it ends with the termination of pregnancy. Palliative remedies are: inunction with vaseline after a prolonged soda-bath. Application of carbolic acid (℥j to water Oj); or lin. saponis comp. ℥v, with chloroform ℥j, applied on cloth. It has been cured by smoking a cigar. Solutions of chloral, menthol, or corrosive sublimate may be tried. Also linseed oil and lime-water.

Apart from this nervous itching without any skin lesion, actual *herpes* may occur (*herpes gestationis*), and return with succeeding pregnancies. Patches of redness, some with large bullæ, appear on the buttocks, abdomen, thorax, feet, and forearms, together with itching and burning. Affects young women more than others.

Treatment.—Use same palliatives as recommended above for nervous pruritus. When eruption begins anoint with borated vaseline or glycerol of starch; and when eruption is fully developed dust the surface with powder of bismuth and starch; or starch and talcum. Baths containing starch and bran are beneficial. Tonics, laxatives, and diuretics may be advisable.

Another skin trouble (*pityriasis gravidarum* resembling *pityriasis versicolor*) occurring in feeble women, and diagnosticated from pigmentary deposits by finding the characteristic

parasitic fungi in the scales, microscopically, can be relieved by washing thoroughly with tincture of green soap and applying veratrin, grs. x, in alcohol ʒj.

CHAPTER IX.

INTERCURRENT DISEASES OF PREGNANCY.

A PREGNANT woman may be attacked with pneumonia, measles, smallpox, etc. Such diseases, while in no way *due* to pregnancy, occur as accidental *coincidences* seriously complicating it The prognosis and results of such cases, with regard to the pregnancy itself, and to the life or death of the mother and fœtus, and the rules for treatment, will here be briefly considered, without attempting any complete description of the diseases themselves. The acute fevers—malarial, continued, and eruptive—constitute an important group of these diseases first claiming our attention. They are all attended with *high temperature.* Continued high temperature seriously imperils the life of the fœtus, and, in consequence, the continuance of pregnancy. Fœtal life is further endangered by changes in the composition of the mother's blood and in the maternal blood-pressure—the placental circulation being thereby impaired. The child may also be infected with the mother's disease.

INTERMITTENT FEVER—AGUE.—Pregnancy is not, as was once supposed, a protection against ague. Not only may the mother have it, but also the child *in utero*, the latter being born with enlarged spleen and other evidences of the disease, in consequence. In many cases premature labor occurs; in a smaller number, abortion. The fœtus, if not dead, is often feeble and ill-nourished.

Treatment.—Quinine, or arsenic, as in cases without pregnancy. The fear of quinine *producing* abortion may be dismissed; the disease is much more to be feared than the medicine. Women in malarial districts who escape ague during

pregnancy are liable to it after delivery. The attacks may be prevented by giving quinine during a few days following parturition.

Relapsing Fever ("Famine Fever").—Nearly all pregnant women attacked with this fever abort or have premature labor. Abortion is most common, and is attended with danger of great hemorrhage. Hemorrhage from the uterus may precede, and then contribute to produce, the abortion.

Treatment should be especially directed to the control of this hemorrhage before, during, and after delivery. The treatment of the fever itself should be essentially the same as in cases not complicated with pregnancy—care being taken to control elevation of temperature.

Typhoid and Typhus Fever.—*Typhoid* fever during pregnancy is rare. When it does occur, abortion or premature labor is frequent. In *typhus* fever only about half the women abort. There is less danger of uterine hemorrhage in typhus than in typhoid. In both diseases the child is liable to be feeble, or dead, or it may die with symptoms of the mother's fever within a few days. The control of uterine hemorrhage and of high temperature constitutes the *special* element of treatment, besides the remedies commonly addressed to these fevers when uncomplicated with gestation. The prognosis, as to the mother's life, is grave, but the majority recover.

Yellow Fever.—This is a most dangerous complication of pregnancy; not less than two-thirds of the women die. Pregnancy affords no immunity from the disease, and parturition increases the liability as well as the danger. Abortion, and consequent hemorrhage, suppression of urine, and uræmia are the chief causes of mortality. In cases that recover, and without miscarriage, it is said immunity from the disease is conferred upon the offspring.

Scarlet Fever.—This is more liable to occur during the puerperal state than during pregnancy, when it is comparatively rare. Both conditions add greatly to the mortality of the disease. Great liability to abortion or premature delivery —liability varies in different epidemics, owing, probably, to the

varying type of the prevailing disease. Lying-in women exposed to scarlatinal infection develop a modified form of puerperal fever, attended with peritonitis, cellulitis, and great mortality, called "Puerperal Scarlatina." During pregnancy scarlatina is a grave complication, both from abortion, and from the kidney trouble of the fever adding to the albuminuria and renal trouble of gestation, especially in primiparæ. In some cases pregnancy continues, both mother and child recovering without injury. Children are sometimes born with desquamation of the cuticle and other evidences of having had the disease *in utero*.

Treatment.—The same as for scarlet fever in the non-gravid. As a rule, pregnancy should not be artificially terminated, except, perhaps, in bad cases of albuminuria and uræmia. Some obstetricians advise it to save a viable child, when the mother's life is in great jeopardy.

Measles (Rubeola.)—Very rare during pregnancy. Liability to abortion. The child may be born bearing the eruption of measles, or develop the disease shortly after birth. Its death *in utero* is supposed to be the chief *cause* of the abortion. Danger of metrorrhagia (if abortion occur), which may be fatal to both child and parent. Rubeola during the puerperal state is frequently complicated with pneumonia —a complication of considerable danger.

Smallpox (Variola).—*Confluent* smallpox nearly always causes abortion or premature delivery, and is nearly always fatal to the mother, the danger increasing with the advance of pregnancy.

In *discrete* smallpox also abortion is very frequent, but less so than in the confluent variety, and the mother usually recovers. The child may be born with or without the disease, and, in some cases, with pits or scars indicating its having passed through it. Exceptionally, the child may have smallpox and the mother not have it. In twins, one child may have it and the other escape.

Abortion is liable to be attended with profuse hemorrhage. As a rule, the child, whether viable or not, is born dead. A very few survive.

Every pregnant woman exposed to variola should be vaccinated, unless protected by previous vaccination of recent

date. A recently delivered woman, as a rule, should not be vaccinated; though it may be justifiable under circumstances of great exposure to a very virulent contagion. As a rule, it will be advisable to vaccinate the child, unless it exhibit evidences of variola. While in some cases the child appears to be protected by the mother having had smallpox during pregnancy, there is no certainty of this protection.

Varioloid during pregnancy involves only slight danger.

Cholera.—Liability to this disease the same during pregnancy as without it. Mortality greater as pregnancy is advanced. Abortion or premature labor is frequent, and may even occur after the woman survives the attack. Many die before the womb empties itself. Mild cases may recover without abortion. The child dies from asphyxia, or cholera infection, or from pathological changes in the uterine mucous membrane, chorial villi, and placenta. The clinical history is the same as in cases without pregnancy; so is the *treatment*. The induction of premature labor—formerly recommended—is not advisable. If labor occur, judicious means to hasten it are admissible.

Pneumonia.—Acute pneumonia during pregnancy is rare. When it does occur the danger to both mother and child is very great, and increases with the advance of pregnancy. During the last three months about half the women die; whereas, if the disease occur during the first six months only one in five or six dies. Abortion or premature labor often occurs, and more often in proportion as the pregnancy is advanced. They greatly add to the danger. In some cases, even of extensive pneumonia, the pregnancy may continue, and both mother and child survive.

The death of the mother is usually ascribed to cardiac failure, sometimes associated with hydræmia and pulmonary œdema. The child dies from high temperature, deficient oxygenation of the blood, and imperfect blood-supply to the placenta.

Treatment.—Prevent the occurrence of abortion or premature labor, if possible. When labor comes on, it should be hastened by all prudent means, as in ordinary cases; in advanced pregnancy, by forceps, etc. The general treatment

must be directed to strengthening the waning heart, viz.: brandy, ammonium carbonate, digitalis and beef essence, with quinine to reduce temperature.

Tubercular Phthisis.—The cases in which pregnancy *seems* to retard the progress of phthisis, or prevent its invasion, are extremely few; those in which it precipitates the disease and hastens its progress to a fatal termination are many. The puerperal state and lactation still further favor the development and progress of phthisis in most cases. Abortion and premature labor are not common, unless the woman's condition be extreme and she is suffering from deficient aëration of the blood, when premature delivery may occur. The subjects of advanced phthisis are not apt to become pregnant: they usually have amenorrhœa, as well as leucorrhœa, and probably do not ovulate. In the earlier stages of phthisis conception is not interfered with. The children of phthisical mothers are usually small in size, but do not necessarily present any manifest evidence of defective development: they are predisposed to the disease, as well as to tubercular peritonitis, meningitis, etc. The placenta is liable to be affected with calcareous degeneration in tuberculous women.

Treatment.—When labor comes on, early assistance should be rendered by forceps, to forestall any increase of pre-existing prostration. The mother should not be allowed to nurse the child for the same reason, as well as for the additional one that her milk would not be proper for it. A wet-nurse or artificial food must be obtained for the infant. Women predisposed to phthisis should be advised not to marry, as well for their own sake as for that of their progeny, who may inherit the disease, and that of their husbands, who may contract it by infection.

Heart Disease.—The heart during pregnancy undergoes a physiological *evolution*, chiefly consisting of hypertrophy of the left ventricle, thus enabling the organ to perform the extra work which pregnancy requires. After labor *involution* occurs, the organ returning to the condition in which it was before conception. When to these physiological changes of evolution and involution are added the valvular lesions of disease, it constitutes a serious and dangerous complication. Most of such cases are those of chronic valvular disease re-

sulting from rheumatic endocarditis. Acute endocarditis may, however, set in during pregnancy, or an old latent case may become acute from the violent strain imposed upon the valves during the exertion of labor. Acute pericarditis is extremely rare during pregnancy, and in the few observed cases pregnancy was not interfered with.

The several results of valvular disease during gestation, varying in different cases, are: dyspnœa, pulmonary congestion, œdema, and hemorrhage; hemorrhage from the nose, stomach, and other organs; general dropsy of the serous cavities, with congestion of the liver and kidneys. During labor, or after it, embolism may occur, the emboli lodging in the brain, liver, or kidneys, with corresponding symptoms. In bad cases abortion or premature labor occurs.

Symptoms indicating serious embarrassment of the circulation do not usually begin until the latter half of pregnancy —about the fifth month; they increase with the advance of pregnancy, and become worst of all during the exertion of parturition. Thus moderate dyspnœa and palpitation may go on to impending suffocation, cyanosis, feeble and irregular pulse, local congestions, and hemorrhages. The fœtus may die from impaired nutrition, or from deficient oxygenation of the mother's blood, or from the mother having metrorrhagia.

Mitral lesions are worse than aortic; mitral stenosis is more grave than mitral insufficiency. The worst cases of all are those in which mitral and aortic lesions coexist.

Treatment.—Women with known valvular disease should be advised not to marry. If passing successfully through one pregnancy they should be advised of the greater dangers of a succeeding one. The medicinal treatment of the heart lesion is the same as in the non-gravid state. Exposure to cold and muscular exertion must be avoided. Should the embarrassment of the circulation and respiration threaten the woman's life, the induction of premature labor is justifiable. Labor, whether spontaneous or induced, should be assisted by art—forceps or version, etc.—so as to hasten its termination and lessen muscular efforts, both uterine and abdominal, on the part of the woman. Moderate anæsthesia, with caution, is advisable during delivery. The liability to acute inflammation about the valves, in consequence of labor, and the possible occurrence of embolism, should enjoin a guarded prognosis, even after delivery.

Jaundice and Acute Yellow Atrophy of the Liver.—Jaundice during pregnancy is rare. In its simple form, under the *treatment* of saline laxatives and diuretics, it may disappear without any serious result to mother or child. But every case becomes of absorbing interest, inasmuch as it *may* be the beginning, or at least the initial manifestation, of that most fatal form of disease, viz.: *acute yellow atrophy of the liver*. This usually begins like simple jaundice, followed by elevation of temperature, frequent pulse, lethargy, delirium, various hemorrhages, petechia, convulsions, stupor, coma, and death. Abortion or premature labor may occur. The fœtus and liquor amnii are sometimes stained with bile pigment. The pathology of the disease is unsettled, as is also its cause. It has been ascribed to phosphorus poisoning in some instances. It may begin as early as the third month; is more likely to appear at the sixth or seventh, or may be postponed till near full term. There are albuminuria and deficient elimination of urea by the kidneys. Pregnancy and the conditions of a first pregnancy predispose to the disease. It has been ascribed to violent mental emotion. It has appeared to be endemic, attacking a number of pregnant women. Treatment is without avail. Emptying the uterus does not save the patient.

CHAPTER X.

ABORTION AND PREMATURE LABOR.

Abortion is delivery of the fœtus *before it is viable—i. e.*, before the end of the twenty-eighth week. Between this time and full term, discharge of the ovum is called "*premature labor*." No other division of the subject is necessary, though some writers limit the term "*abortion*" to discharge of the ovum during the first twelve weeks; if it occur between the twelfth and twenty-eighth week, they call it "*miscarriage*." The symptoms, however, differ somewhat during the first three months from those of the succeeding four, as does also the treatment. Exceptionally the child is viable

before the twenty-eighth week, even a month or two earlier. Such cases are rare.

Frequency.—About one out of every five[1] pregnancies ends in abortion, and ninety per cent. of childbearing women abort once or more during their lives.

Causes.—The *predisposing causes* may refer to either mother, father, or child.

A dead fœtus is generally expelled without much delay. Its death may be due to disease of the placenta or membranes, or obstruction in the umbilical cord, or external injury, or deficient nutrition from a variety of circumstances, or inherited syphilis, or mineral and other poisons derived from the mother, or from the eruptive fevers. High temperature on the part of the mother soon kills the child. When the mother's temperature reaches 106° it is always fatal to the fœtus, and a rise to 104° is dangerous. The temperature of the fœtus is a degree higher than that of the mother.

On the part of the mother, constitutional syphilis is a potent cause. The occurrence of acute inflammation of the thoracic or abdominal viscera; the exanthematous fevers; plethora; anæmia; albuminuria; *excessive* vomiting; constipation; placenta prævia; diseases and displacements of the uterus, especially retroflexion and retroversion; multiple pregnancy; chronic lead-poisoning; chronic ergotism from eating bread made of spurred rye; the precocious, or very late occurrence of pregnancy; the abortion-habit.

On the part of the father, precocity, senility, syphilis, debauchery, and debility may lead to it.

Exciting Causes.—Mechanical violence, as blows, falls, violent exertion, the concussion of railroad accidents, excessive venery, sea-bathing, irritation of the mammæ, tooth-pulling, etc.; or *emotional* violence, as excessive fear, joy, grief, anxiety, anger, etc.

Many abortions no doubt occur from the wilful administration of drastic emmenagogue medicines and from intentional disturbance of the ovum with instruments.

[1] In former editions of this work the frequency was stated to be one out of *twelve* pregnancies. It is probable the frequency is continually increasing with the artificial habits of civilization and the diffusion of knowledge, as to methods of inducing abortion, among the laity.

The above causes act, for the most part, in one of two ways, either by producing *death of the fœtus* or by inducing *uterine contraction.*

The most decided *exciting* causes are often strangely inert in the absence of any *predisposing* ones. In some women with an apparently "irritable uterus" very slight exciting causes will bring on uterine contraction; in others all sorts of injuries and surgical operations—even laparotomies—may be done without any disturbance of the uterus or ovum.

Period of Occurrence.—It occurs most frequently during the second and third months, though, quite possibly, many abortions during the first month are never recognized.

Symptoms.—*Pain*, intermittent in character, and due to uterine contractions—in reality, miniature labor-pains; and *hemorrhage*, due to partial separation of the ovum from the uterine wall.

Chilliness, nervousness, anorexia, *ennui*, flighty pains in the back and abdomen, frequent micturition, and a mucous or watery discharge, may occur and continue some days before "labor-pains" and bleeding, but they are not common until after the third month.

When the unbroken membranes with their contents are expelled entire (like a "soft-shelled egg"), which is most likely to happen during the first three months, the hemorrhage may be only moderate; but when the sac bursts, and collapses after discharge of the fœtus and liquor amnii, bleeding is usually more profuse. In these latter cases the bleeding and pains may cease for hours, days, or even weeks, but if the placenta or membranes be retained, these symptoms are *sure* to return sooner or later; and in case the retained secundines decompose there will be added a putrescent odor of the discharge, and, likely enough, a severe chill, fever, vomiting, general depression, and all the other symptoms of septic infection.

Diagnosis.—Pains and bleeding having occurred, the diagnosis is rendered positive by vaginal examination revealing partial or complete dilatation of the os uteri, and presentation in it of the bag of waters, umbilical cord, or body of the fœtus. Examine *all* discharges, preferably under water,

for traces of membranes, fœtus, and chorial villi, otherwise abortion may occur without recognition. Should doubt arise from discharges having been thrown away, unexamined, it may be stated as a *general rule* that if the womb have completely emptied itself, the symptoms will subside; if otherwise they will continue, or recur, after a possible remission.

Diagnosis of Abortion from Returning Menstruation.—In menstruation bleeding generally relieves the pain; not so in abortion; menstruation occurs at the period; abortion not necessarily so. In abortion there may be a history of violence or some other cause for the symptoms, and the early signs of pregnancy will have appeared. Should digital examination not afford sufficient evidence to clear up doubt, a *positive* diagnosis may be impossible until the os uteri have sufficiently dilated to admit the finger-end, or until a part of the ovum has been expelled and recognized.

Diagnosis of Inevitable from Preventable Abortion.—Persistent and profuse hemorrhage, frequency and severity of the pains; considerable dilatation of the os uteri, which rapidly progresses, *as a rule*, indicate that the abortion cannot be prevented; but exceptions may occur. If the fœtus be dead, or the membranes broken, the abortion becomes still more inevitable; but it is not easy in all cases to be sure on these two points, and *very* exceptional cases occur in which a dead fœtus is retained for months and years. A pregnancy has even been known to continue after the membranes have been punctured, and after pieces of the decidua have been discharged, following the introduction of the uterine sound. Most cases follow the *general rule* first above stated.

Diagnosis of Incomplete Abortion.—In cases where the discharges have not been carefuly examined, or have been thrown away without examination, and in which demonstration that the entire ovum has been expelled is in this way impossible, the only sure method of diagnosis is to pass a finger into the uterus and feel whether portions of the placenta and membranes still remain.

Diagnosis of Complete but Concealed Abortion.—This is very difficult. It depends chiefly upon the history of signs and symptoms indicating pregnancy and abortion; and

upon the recognition of an enlarged uterus growing smaller by involution, the lochial discharge, and sometimes the appearance of milk in the breasts.

Diagnosis of Fœtal Death.—The *signs of fatal death* are: languor, low spirits, pallor, chilliness, perhaps some fever, sunken eyes surrounded by darkened rims, nausea, anorexia, fetid breath, and bad taste in the mouth; a feeling of weight, discomfort, and coldness in the hypogastrium; flabbiness, with stationary or diminished size of abdomen, with loss of its normal firmness and elasticity; the uterus rolling more easily from side to side; flaccidity and diminished size of breasts, with the appearance of milk in them. These symptoms may not come on until *some time after* fœtal death. They may also be produced by other causes. The occurrence of several is necessary for diagnosis, which last, even then, may not be positive. Fetid discharges *per vaginam*, with or without exfoliated epidermis, are more reliable. When pregnancy has sufficiently advanced, the absence or cessation of previously recognized heart-sounds and fœtal movements is important. (For signs of fœtal death during labor, at or near full term, see Chapter XXII.)

Prognosis.—Abortions often consume more time than full-term labors, owing to the long and narrow cervix uteri, and, as yet, imperfect development of the uterine muscles. The secundines are often retained hours or days after discharge of the fœtus. With proper treatment abortion is seldom fatal; it is less dangerous than full-term delivery, as regards the chances for life, but it is far more likely to leave chronic uterine disease and great debility from hemorrhage.

The chief dangers are hemorrhage and septicæmia from retained secundines.

Treatment.—The treatment of abortion will differ much according as we design to prevent, or, on the other hand, hasten delivery.

If the hemorrhage be only slight in degree, and the pains feeble, if the os uteri be not much dilated, and the membranes not broken, we strive to continue the pregnancy; if opposite conditions prevail, we cannot do so, but must hasten delivery to put the woman in safety.

Should the fœtus be dead, the uterus must, of course, be emptied.

Treatment to Prevent a Threatened Abortion when the Symptoms are Slight.—Absolute rest in the recumbent posture, in a cool room, with light bed-clothing. Mental and emotional quiet. Cooling drinks, avoidance of all stimulants. *Opium* (preferably the liq. opii sedativus, gtt. xx–xxx) to arrest uterine contraction and check hemorrhage; or a suppository of morphia. The opiate to be repeated every two hours, or as often as may be necessary to stop the pains. Chloral in ten-grain doses; or phenacetin five to ten grains, may be used in same way. Dr. Playfair prefers chlorodyne in ten-minim doses every three or four hours. Mild laxatives—salines, castor oil, or simple enemata of warm water—should be used to overcome constipation produced by the opiates. Never use ergot or the tampon; and the application of cold cloths to prevent hemorrhage is of doubtful utility; it rather augments uterine contraction. The *Viburnum prunifolium* (fld. ext. ʒj, or solid ext. gr. iv in pill every two or three hours) is alleged to be a valuable preventive of abortion; it quiets uterine contraction. Evidence in favor of its utility is increasing.

Remove any known cause of the symptoms; and restore, by posture and gentle manipulation, any existing uterine displacement, especially retroversion or retroflexion.

Efforts to prevent abortion must, of course, cease after the *fœtus is dead*, but of this last event there is, during the first three months, no unequivocal sign. Reduction in the size of the uterus, or its smallness when compared with the known duration of the pregnancy, is perhaps of most diagnostic value in this respect.

Treatment when the Abortion is Inevitable.—Let it be premised that in all manipulations and operative measures—whether digital or instrumental—resorted to in abortion cases, the same *rigid antiseptic technique* must be observed as in full-term labors or surgical operations. The external genitals must be made aseptically clean by (*first*) scrubbing with hot water and soap, and (*second*) swabbing with a 1 to 2000 bichloride of mercury solution. The vagina to be washed out with the same. The hands and nails of the operator to be cleansed in a similar manner and rinsed in a 1 to 1000 solution of the bichloride. All instruments to be sterilized by immersion in boiling water, or in a 5 per cent. solution of carbolic acid, or

a 2 per cent. solution of creolin. Textural fabrics, used for tampons, etc., must be rendered aseptic, either by dry heat (baking) or by immersion in some germicide fluid. (For further particulars as to antiseptics, see Labor, Chapter XII.)

In most cases of abortion delivery may be left to complete itself by the natural powers. This is especially true of cases occurring during the first two months of pregnancy. Interference may be required in these, and later cases, on account of *excessive hemorrhage*. This may always be *surely* arrested by the vaginal tampon properly applied. The tampon also *stimulates uterine contraction*, and promotes complete separation of the ovum from the uterus by causing effused blood to back up and accumulate between the womb and fœtal membranes. The tampon is a vaginal plug, consisting, preferably, of disks of antiseptic cotton, cheese-cloth, or gauze. When these are not at hand, in cases of emergency, pieces of old sheeting, or of a soft towel, or an unrolled roller bandage may be used. They should first be soaked in a 1 to 2000 solution of bichloride of mercury, and wrung out; or in a weak solution of carbolic acid or creolin. To facilitate easy withdrawal of the tampon, its pieces may be connected by a continuous string (like the bits of paper on a kite-tail).

Before introducing it, empty the bladder; wash out the vagina with the bichloride solution, and apply the tampon through a speculum (preferably Sims') with a long pair of ordinary dressing forceps. Let the first pieces be packed behind, and then others all round the cervix uteri, and so continue until the vagina be *completely* and *compactly* filled, withdrawing the speculum by degrees as the packing proceeds above it. To prevent the vagina expelling the plug, place an antiseptic pad over the vulva, secured by a T bandage.

When no speculum is at hand, pass two fingers into the vagina, thus separating the labia, and push up the pieces of cotton between them with the dressing forceps, each piece being anointed with carbolized oil or glycerin to prevent friction and chafing of the vulva. Be careful to avoid turning in any hair.

The plug must not remain in the vagina longer than twelve hours—better not more than six or eight. If the woman be very weak from hemorrhage, a second one should be in readiness before the old plug is removed. The bladder must again

be emptied by the catheter if required, and the vagina cleansed with carbolized water. It is not always necessary to repeat the tampon. The ovum may be found in the vagina (when the plug is removed), from whence it may be easily extracted, and if entire, with cessation of bleeding. Nothing further will be needed than cleansing the vagina with an antiseptic solution. Should the hemorrhage continue, and the ovum still remain *in utero*, repeat the tampon, and give ergot (fld. ext. ʒss–j every three hours). We may be able to expedite delivery by careful manipulation, when the os is dilated and the ovum protruding through it, but if the membranes be still intact we had better abstain from this effort lest we rupture them. The repetition of the tampon should not be continued longer than twenty-four hours. After this time it will be better to adopt the more radical measures of extraction by finger or curette mentioned further on.

It is very common after the third month, less so before then, for the fœtus to be expelled, leaving the membranes (and placenta, if it be developed) *in utero*. When this occurs during the first three months, the cord must be cut or broken (no ligature is necessary), the fœtus removed, and the case treated by ergot, and the tampon, as before described. During and after the fourth month the tampon is not advisable, for the uterine cavity is then large enough to contain considerable blood, and the uterus is also sufficiently large to be subjected to compression and grasping of its wall with the hand through the abdomen, by which discharge of its contents, contraction, and arrest of hemorrhage may be effected, or *two or three* fingers may be passed into the uterus (the cervix being sufficiently open) and the placenta detached and withdrawn.

So long as any part of the secundines is retained, even though the bleeding temporarily cease, and whether it be before or after the third month, there is always risk of the blood-flow recurring, as well as of septicæmia (from decomposition of the retained matters), pelvic peritonitis, and cellulitis. Hence it is safer in any case to secure delivery of the secundines without delay. In cases where the placenta is not adherent, but simply *lodged in the cervix*, it may be hooked down and dislodged with the finger. When it is retained higher up in the uterine cavity, a finger or blunt curette may be passed to the fundus (provided the os be sufficiently patulous, and if not it should be dilated with the steel dilator), by

which the entire retained contents may be effectually and completely removed. In using the finger, it should be passed into the womb along one side, then sweep across the fundus, and down along the other side. No man's finger is long enough to do this, unless the uterus be *pressed down by the other hand upon the abdomen*. Should this pressure be painful, ether may be used for anæsthesia. Placing the woman in the lithotomy position greatly facilitates the proceeding.

In any protracted case, the vagina should be freely washed out at least twice daily with some antiseptic solution; and when the finger or instruments have been placed in the uterus, it too should receive a similar injection, *care being taken that the fluid immediately and freely returns from the uterine cavity*, by noting that the os is sufficiently open for this purpose. Hot water, as hot as can be borne, injected for fifteen minutes continuously into the *vagina* and against the cervix, will often arrest the hemorrhage temporarily, and is a good preliminary to the introduction of a vaginal tampon.

The after-treatment of abortion must be continued rest, as after a full-term labor.

In women who have aborted once or more, and who are likely to establish in this way the "abortion-habit," we should enjoin abstinence from *coitus* for a year or more; removal of all suspected causes of the accident; when pregnancy again occurs, insist on perfect rest *in bed* for a week or ten days at times corresponding to the menstrual epoch. After conception, *coitus* must be forbidden during gestation.

Imperfect Abortion.—When remnants of the ovum remain *in utero*, as they may do for days, weeks, or even months, after a supposed complete emptying of the womb, it is termed "imperfect" or "incomplete" abortion.

All symptoms may subside, wholly or in part, but sooner or later hemorrhage will recur, with discharge of decidual or placental débris, which may or may not be putrescent—in the former case endangering septicæmia, etc. Such cases result from, and also lead to, endometritis. Retained blood may deposit successive layers of fibrine upon fragments of membrane or placenta, constituting so-called "fibrinous polypus." Renewal of pains and bleeding ultimately result.

Treatment consists in completely emptying the uterus with the finger or curette, and the use of antiseptic injections.

Missed Abortion.—As, at full term, the child may die and

remain *in utero* weeks or months afterward, constituting so-called "missed labor," so, during the earlier months of pregnancy, death of the fœtus may occur and the ovum still remain weeks or months in the uterine cavity; this is "*missed abortion.*"

In these cases the symptoms of pregnancy are arrested; milk may appear in the breasts; the liquor amnii is absorbed; the child macerates or becomes "mummified"—rolled up in the placenta or membranes like a parcel—but usually it is *not* putrid, for the unbroken membranes have protected it from atmospheric germs.

Pains, bleeding, and unexpected discharge of the mass usually result. When this last does not occur in *suspected* cases (*positive* diagnosis is difficult), catheterism of the uterus, or dilatation of its cervix by tents, to provoke contraction and expulsion of the ovum, is the proper treatment; or the cervix may be rapidly dilated with the steel dilators, and the contents of the uterus removed by the finger or curette, as in other cases.

Before concluding this chapter on abortion it may be well to remind the reader that with regard to the *treatment* of those cases that do not terminate spontaneously, and which require interference either from excessive and continued hemorrhage, or on account of retention of the secundines, *two methods* of practice have grown up, viz.: *first*, the *expectant* method, comprising the use of the tampon, ergot, gentle expression, or digital extraction of the placenta when it presents in the os uteri, reserving the more radical method of scraping out the uterine cavity for cases in which decomposition of the secundines is beginning, or in which frequently recurring or long-continued hemorrhage has rendered more active measures necessary; *second*, the *radical* or *active* method, by which *all* cases considered beyond prevention are treated actively *from the beginning*, the woman being anæsthetized, the os and cervix uteri rapidly dilated with steel instruments, and the curette used to empty the uterus—scraping out fœtus, placenta, and the entire decidua by one complete operation—just as a polypus or other morbid neoplasm would be removed by a somewhat similar surgical proceeding. Both methods of treatment have their respective advantages and disadvantages; both have earnest advocates; neither plan has been universally adopted. There will probably always be cases,

or at least circumstances, in and under which each of the two methods may be judiciously employed.

Treatment of Premature Labor.—The management of labor after the seventh month is about the same as at full term. Dilatation of the os may be slow, but the child is smaller. The placenta is liable to be retained, but not so long as in abortion cases. Its delivery may be expedited by compression of the uterus through the abdomen, or, if this fail, and the occurrence of hemorrhage necessitate interference, two or more fingers, or the half hand or whole hand (according to the degree of dilatation of the os uteri, and the period to which pregnancy has advanced), may be introduced into the womb and the placenta peeled off with the fingers and extracted.

CHAPTER XI.

EXTRA-UTERINE PREGNANCY, ETC.

Extra-uterine Gestation (Extra-uterine Fœtation; Ectopic Gestation).—Development of the ovum outside the uterine cavity. Since some cases, while *misplaced*, are not entirely outside of the uterus, the term "*ectopic*" is perhaps best.

Varieties.—The ovum may lodge in the Fallopian tube (*tubal pregnancy*); when lodged in that portion of the tube which passes through the uterine wall, it is called "*interstitial pregnancy.*" Rarely the tube is congenitally deformed; it enters the uterus externally as usual, but then descends in the muscular wall and opens into the uterine cavity lower down. An ovum lodged in such a tube would constitute a veritable "*interstitial pregnancy.*" The ovum may remain in the ovary after the Graafian vesicle has ruptured (*ovarian pregnancy*); or it may find its way into the cavity of the abdominal peritoneum (*abdominal pregnancy*). There are several sub-varieties mentioned further on.

Tubal Pregnancy is the most common variety, but all forms of extra-uterine gestation are rare.

Causes.—Spasm, paralysis, stricture, sacculated dilatation, doubling of or pressure upon the tube, causing obstruction of its canal. The tube may be compressed by tumors outside of it, or drawn out of place, bent, and fixed at an angle by contracting adhesions, the result of peritonitis. It may be obstructed by small polypi. In twin cases, each ovum may interfere with the passage of the other through the tube, hence twins are *relatively* more frequent in tubal pregnancies than in normal ones. Fright during coition is an alleged but doubtful cause. Tubal pregnancy is more apt to occur after than before thirty years of age and also after prolonged sterility.

Prognosis.—All forms of extra-uterine pregnancy are extremely dangerous. The tubal variety is the most fatal of any; if let alone nearly every case dies; by suitable treatment many are saved. The fatal results are explained as follows: As the ovum grows, that part of the tube in which it is placed grows with it and becomes distended into a sac or cyst—really a miniature uterus. Usually within the first three or four months the growth of the ovum bursts the cyst, the wall of the latter *ruptures*, and from its bleeding vessels there occurs a rapidly fatal hemorrhage into the abdominal cavity; sometimes death from collapse within an hour. Exceptionally the hemorrhage is *not* fatal; then follows peritonitis (and its dangers) produced by the presence of blood, fœtus, liquor amnii, etc., in the peritoneum. Should death still not occur, the fœtus may become re-encysted by a wall of organized inflammatory lymph, and the sac or cyst thus newly formed, at a later date inflames, suppurates, and eventually discharges, like any other abscess, into some neighboring cavity. Death from septicæmia or exhaustion may result. Finally, the re-encysted ovum may remain, without any inflammation, become partially absorbed, leaving a calcareous, inorganic remnant (so-called lithopædion: stone-child), which may give no further trouble during a long life.

Symptoms and Diagnosis of Tubal Pregnancy.—This abnormal condition is most often not suspected before symp-

toms of approaching rupture begin; sometimes not until actual rupture has taken place.

The *symptoms preceding rupture* are extremely important, but the diagnosis is difficult. The early signs of pregnancy exist. The menses are absent, but *reappear irregularly after one or two months*, leading the woman to doubt her supposed pregnancy. The discharge is mingled with *shreds* of broken-down uterine decidua. The womb is somewhat enlarged, but not as much as it should be in a normal pregnancy of the same duration. A tender and painful tumor (the tubal cyst) is discovered on the side of the uterus, in the vicinity of one of the broad ligaments. It grows rapidly; the womb does not. The tumor may be detected by the bimanual examination; it is somewhat soft and fluctuating. Should the vaginal finger recognize ballottement the diagnosis is certain. Owing to pressure upon the bowel there may be *rectal tenesmus* in addition to constipation. Pressure upon vessels and nerves causes œdema and pain in the limb of the affected side; these occur earlier and are more severe than in normal gestation, and may be accompanied with slight elevation of temperature. The womb may be pushed on one side by the growing ovum. Eventually a severe, tearing, colicky, intermittent pain occurs in the region of the tumor, produced by contractions of the wall of the tubal cyst; the "miniature Fallopian uterus" is irritated to contract by distention; it is having "pains;" but since there is no outlet for its contents, it bursts.

Symptoms of Rupture.—Severe and sudden abdominal pain, with intense collapse, pallor, feeble and frequent pulse, etc. Rapid swelling of the abdomen, low down, and at first on the side occupied by the tumor; later, all over. The swelling is soft and doughy; it is produced by blood effused into the peritoneum. Syncope, nausea, and retching, cold sweats, etc., precede the fatal event.

Treatment before Rupture.—When surgical skill is available the proper treatment is cœliotomy. After thorough cleansing and sterilization of the abdomen and pubes, as well as of the instruments and hands of the operator and assistants, the bladder is emptied and the patient anæsthetized. An incision three inches long is then made in the median line above the pubes down to the peritoneum, any bleeding vessels being

twisted before opening the peritoneal cavity. The peritoneum is then incised; the intestine kept back by pads of cotton or gauze wrung out of the sterilized water; the operator's fingers bring out the distended tube and ovary at the incision after having freed them from any existing adhesions; the pedicle is then transfixed by a double ligature of sterilized silk, and each half of it tied securely according to surgical rule. The pedicle is cut, and the entire mass—tube, fœtal cyst, and ovary—removed. The pads are then withdrawn and the abdominal incision closed and dressed in the usual manner. In case of threatened collapse from hemorrhage during the operation, the peritoneal cavity may be flooded with a 1 per cent. sterilized solution of common salt at a temperature of 110° F., a quart of this solution having been previously prepared. It is rapidly absorbed by the peritoneum, and acts as a restorative—like transfusion.

The device of *killing the fœtus* to stop its growth, and thus forestall further distention and rupture of the cyst—by the various methods of (1) aspiration of the liquor amnii; (2) injection of morphia, etc., into the amniotic sac; and (3) by electricity—has, for good reasons, been abandoned. The first two methods are no longer thought of. That of destroying the life of the fœtus by electricity, while inadvisable, might still be worthy of consideration when surgical skill was unobtainable or the patient and her friends refused surgical interference. The method of procedure is as follows: A faradic current is passed through the cyst in a series of sharp shocks, and repeated every day till diminution in the size of the tumor and retrograde changes in the breasts indicate fœtal death. One pole (the negative) is passed into the rectum or vagina and placed in contact with the tumor, while the positive pole is applied on the abdomen. Electricity should *not* be used when there are signs indicating impending rupture; it would hasten that unhappy event.

Treatment after Rupture.—Cœliotomy is here unquestionably the best method to pursue. The abdominal cavity should be opened by incision, the Fallopian tube, with the cyst, fœtus, ovary, and effused blood, removed, in the manner just previously described for cases *before* rupture, extra care being taken, in the ruptured cases, to *quickly* secure the bleeding vessels of the ruptured tube from further hemorrhage.

The sterilized salt solution may be used to recuperate the patient from collapse, as in cases operated upon before rupture, just previously described; the operation to be performed with the strictest antiseptic precautions. In twenty-one operations performed *immediately* after rupture of the cyst, by Mr. Lawson Tait, twenty women were saved. Lack of surgical address, daring, and skill; the want of surgical instruments and antiseptic appliances; and the dread of operating upon women almost at the door of death, will doubtless continue, as in the past, to prevent the performance of this operation in many cases where it ought to be done. In some cases, after opening the abdominal cavity, the fœtal cyst may be found so firmly and extensively adherent to adjoining viscera and other tissues as to render its removal extremely difficult and dangerous or even impossible. Enucleation of the sac should here not be attempted. In some of these cases it may be stitched to the abdominal wound, emptied of its contents, washed out with a weak bichloride solution (1 : 20,000), and packed with iodoform gauze. In other cases where the sac is low in the pelvis and easily reached through the vagina it may be opened through that canal, cleared of its contents, washed out, and packed with gauze, leaving a free opening for drainage. In doing both an abdominal and vaginal operation on the same occasion the hands of the operator must, of course, never pass from the vagina to the abdominal wound without thorough disinfection. It would be best to have the abdominal incision closed by the uncontaminated hands of an assistant. Should no operation be attempted, the only remaining treatment is that of expectancy –a forlorn hope. The woman must be kept absolutely at rest; opium given to relieve pain; stimulants to prevent collapse; with ice to the abdomen and compression of the aorta to control hemorrhage. There is a bare chance the bleeding may stop and the fœtus become re-encysted by a wall of inflammatory exudation, and so remain harmless,[1] or be discharged later by abscess and bursting of the cyst, either externally or into some neighboring viscus, as already explained.

Intra-ligamentous Pregnancy (Extra-peritoneal, sub-peritoneo-pelvic, sub-peritoneo-abdominal).—This

[1] Virchow (Cellular Pathology, p. 325) found the muscles of the fœtus perfectly intact after remaining thirty years in the body of its mother.

is a variety of tubal pregnancy in which the tube ruptures between the layers of the broad ligament—between two *external* surfaces of peritoneal layers, not into the peritoneal cavity. The effusion of blood is restricted by these layers of broad ligament and the connective tissue uniting their apposed surfaces. Hence the hemorrhage is less likely to be rapidly fatal, constituting a limited hæmatocele, which may become absorbed, leaving a lithopædion, or develop into an abscess later on. The newly formed hæmatocele *may*, however, undergo a *secondary* rupture through the distended broad ligament and *into* the peritoneal cavity.

The *diagnosis* of intra-ligamentous cases depends chiefly upon the collapse from hemorrhage being *less severe* and upon the recognition of a *rapidly formed* but still circumscribed *tumor* independent of the uterus, in which may be felt fluctuation and perhaps pulsating vessels. This tumor is formed by clots of effused blood circumscribed between the folds of broad ligament, quite different from the doughy enlargement diffused over the whole abdomen when hemorrhage has taken place inside the peritoneal cavity. Moreover, rectal examination shows Douglas' *cul de sac* to be *empty*, while in the intra-peritoneal cases it is *filled* with effused blood.

Treatment.—Surgical interference not usually necessary. By rest and recumbency, with treatment for the anæmia following the moderate hemorrhage, the effused blood may be absorbed, and the woman recover. Later on suppuration may occur, with symptoms of sepsis—chills, fever, rapid pulse, vomiting, etc.—when abdominal section will be required. It is in these broad-ligament cases that entire removal of the cyst will often be difficult and dangerous, and when it will be better to open the sac and stitch it to the abdominal wound, as just previously explained.

Interstitial Pregnancy (Tubo-uterine).—The ovum is in that part of the tube passing through the uterine wall. Extremely rare. Rupture may occur into the peritoneum; or that surface of the fœtal cyst toward the interior of the womb may rupture and the fœtus escape into the uterine cavity, and come out by the natural passage. It is less fatal than tubal pregnancy, and may rarely advance to full term. Differential *diagnosis* from other varieties very uncertain. The womb is irregularly enlarged; the tumor moves with the

uterus; the uterine cavity is empty. Possibly the finger *in utero* may recognize the bulging wall of the fœtal cyst and its contents. If so, this wall may be incised and its contents discharged through the uterus and vagina. Should rupture occur into the peritoneum, or should the condition be recognized before rupture, the best *treatment* is cœliotomy.

Ovarian Pregnancy.—Its occurrence has been disputed, but a few cases have undoubtedly been observed. The ovisac (Graafian vesicle) ruptures without the ovule escaping; spermatozoa enter through the rent, hence impregnation and gestation begin in the ovary. The wall of the ovisac and stroma of the ovary dilate to form the fœtal cyst; but gradual distention may force the ovum partially out of the ovary and into the peritoneum, the portion escaping being circumscribed by peritoneal adhesions. Rupture usually occurs within three or four months, with the several results usually produced by rupture of tubal cases. Differential *diagnosis* well-nigh impossible. *Treatment:* practically the same as for tubal gestation.

Abdominal Pregnancy.—In these cases the ovum is neither in the womb, tube, nor ovary; it is in the cavity of the peritoneum; its growth is not curtailed by any resisting muscular wall. The pregnancy therefore may, and usually does, go to full term—a history surprisingly different from the rupture occurring in other varieties previously described. The placenta has been found attached, in different cases, to all parts of the peritoneum; to that covering the uterus, the bladder, the colon, the small intestine, the mesentery, the stomach, the kidney, the omentum, the lumbar vertebræ, etc.

Abdominal pregnancy is said to be *primary* when the impregnated ovule, failing to pass from ovary to tube, drops down into the cavity of the peritoneum, and attaching itself to that membrane, begins there its primary development. The existence of this variety has been denied and thought to be impossible; it is said the peritoneum would digest the ovum, etc. But that impregnation may really occur in the abdominal cavity is shown in a case where the body and part of the neck of the uterus had been removed, the ovaries remaining. Semen passed in through a fistulous opening in the stump of the cervix, and abdominal pregnancy followed.

Most cases of abdominal pregnancy are said to be *secondary*,

that is to say, they begin as tubal, ovarian, interstitial, or intra-ligamentous cases, and after rupture become, *secondarily*, abdominal cases. The ovum remains partly connected with its first sac, but wherever it touches the peritoneum a proliferation of connective tissue occurs, and so the sac is enlarged and continues to grow, forming adhesions to various visceral layers of peritoneum. More rarely there are no restricting pseudo-membranes, the ovum, surrounded by its amnion and chorion, being free in the abdominal cavity. And still more rarely the amnion and chorion may *also* rupture, leaving the child loose in the cavity of the abdomen. It then usually dies, but exceptionally does not, but pursues its development in a new sac of proliferated connective tissue.

Symptoms and Diagnosis.—Nothing special occurs during the early part of pregnancy, except that the uterus does not enlarge correspondingly with the duration of pregnancy. Attacks of pain in the abdomen may occur, with fever, due to local peritonitis, and sometimes pain is produced by fœtal motions. Most cases progress without other remarkable symptoms; sometimes there may be partial rupture of the cyst, with moderate bleeding and prostration, and subsequent recovery. Late in pregnancy the movements of the child are more easily felt, and the sounds of its heart more distinctly heard than in normal pregnancy. Small size of the uterus precludes the possibility of its containing the fœtus. At full term labor-pains begin—uterine contractions—with discharge of the uterine decidua and some blood, and the fœtus, till now alive, well, and normally developed, soon dies. It may remain for many years without change; or become partially absorbed, leaving a lithopædion; or again, which is most common, the cyst becomes inflamed and suppurates, the child breaks up, decomposes, and the whole contents of the abscess are discharged through fistulous openings into the adjoining visceral cavities, or externally through the skin, the woman being liable to death from exhaustion, septicæmia, etc. In cases where a diagnosis is *almost* certain, it is admissible to make it *quite* so by passing a finger through the dilated os uteri, thus demonstrating the emptiness of the uterine cavity.

Treatment.—In abdominal pregnancy we often have to deal with a *live* child and with a developed *placenta*, this latter

not being attached to any muscular structure—like the wall of the uterus—which will contract and prevent bleeding after suppuration, hence danger of hemorrhage.

If the child be alive, and the woman present no very serious symptoms, nothing should be done before full term. Then, one of two courses is available: either "*primary cœliotomy*" before the child dies, and in order that it may be extracted alive; or "*secondary cœliotomy*" some weeks, or even months, after its death. Which is the better plan has long been a matter of discussion, and still remains unsettled. By the primary operation the child is sometimes saved, but the risk to the mother is so great (chiefly from hemorrhage at the placental site) that secondary cœliotomy has been until recently preferred. Lately, with improved methods of operating, the primary operation is growing in favor, and the chance of saving both child and mother increased. When the child has died, whether at term or before, there should be no operation for at least a month or even much longer, provided no symptoms of septicæmia arise. This delay allows obliteration of the placental vessels and lessens the risk of hemorrhage during and after the operation. It also gives a chance for the "lithopædion" process, but this is seldom realized. So long as the dead child remains, however, the risk of septicæmia remains also. Delay must be measured by the case, not by rule. Some advise the abdomen to be opened "as soon as the placental circulation has ceased, as certified to by the absence of placental murmur." The *operation* (with all antiseptic precautions) is done by making an incision in the linea alba. Should the fœtal sac not be adherent to the abdominal wall it must be stitched to the incised surfaces of the wound before being opened. When opened the child is removed, the funis cut off close to the placenta, but the placenta *left undisturbed*, to come away spontaneously, which it will do after some days or weeks, the lower end of the incision being left open to permit its discharge, as well as for a drainage-tube and washing out of the sac with antiseptic fluids. To attempt separation of the placenta insures immediate and dangerous hemorrhage. Even when it is left, hemorrhage may occur later. An improved mode of operating has been successfully practised to avoid both the danger of hemorrhage and septicæmia. It consists in *excecting* the entire *cyst and placenta* at once, not

by tearing or peeling them away, but by first clamping and then ligating, bit by bit, all vascular connections of the cyst and placenta, the parts tied by the ligatures being then severed by incision. This method will probably supersede that of leaving the placenta undisturbed. At present the matter is unsettled.

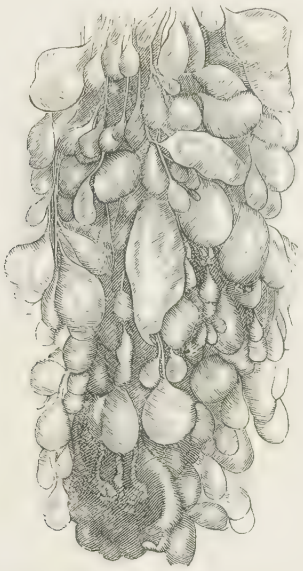
When, in neglected cases (without cœliotomy), the fœtus and liquid contents of the cyst are being gradually discharged through fistulous openings, these openings should be enlarged, by careful stretching with steel dilators, antiseptic washes thrown in, free drainage secured, and pieces of bone or other obstructing débris removed by manipulation. The woman is given iron, quinine, food, and stimulants to prevent exhaustion, and opiates to relieve pain.

Hydatidiform Pregnancy (Cystic Degeneration of the Chorial Villi. Vesicular Mole).—The fœtus dies *early*, and usually dissolves and disappears, and then the villi of the chorion—the bulbous ends of their branches—become distended with the fluid into little sacs or cysts of different sizes, which continue to increase in number till the uterus be filled. Technically, the disease is *cystic* (or dropsical) *degeneration of the chorial villi*. The cysts hang by long, narrow pedicles, like diminutive elastic pears, or dangle from each other, suggesting a resemblance to serpent's eggs. Viewed *en masse*, they look like a bunch of grapes, but their branching stalks are not derived, like a bunch of grapes, from one main stem, but one cyst is joined by its pedicle to another, and this again to another, until the final pedicle is traced to the membrane of the chorion. Some of the cysts are half an inch in diameter or a little over—most of them much smaller. (See Fig. 64.)

The degenerated villi may penetrate deeply into the muscular wall of the uterus, even to the peritoneum, and thus lead indirectly to rupture of the uterus. In some cases of twins the chorial villi of one fœtus may degenerate, while those of the other do not—the latter child reaching, possibly, full development. In other cases only a part of the villi becomes diseased, enough remaining healthy to form a placenta, and the pregnancy goes to full term with a well-formed child. The degenerative process usually *begins* during the first month of pregnancy: its commencement is seldom postponed later than the third month.

Causes.—It has been ascribed to constitutional syphilis, morbid changes in the decidua, early death of the fœtus, etc., but the question is still unsettled.

FIG. 64.



Hydatidiform degeneration of the chorial villi.

It has been called *hydatidiform pregnancy* from a crude resemblance to, and a former *erroneous* supposition that the cysts were identical with, *true* hydatids (entozoa, acephalocysts), such as occur in the liver and other organs (possibly in the uterus), but which have nothing to do with impregnation, or an ovum.

Remnants or repeated new developments of the growth may appear months or even years after impregnation. In women separated from their husbands, unpleasant complications might thus arise, and the case assume medico-legal importance.

Diagnosis of True Hydatids from Hydatidiform Pregnancy.—In true hydatids the cysts develop, some *inside* of others,

and the echinococci heads and hooklets may be seen with the microscope. This microscopic appearance is wanting in hydatidiform pregnancy, in which, also, we have seen the cysts hang by stalks and increase by a sort of budding process—*not* inside each other.

Symptoms of Hydatidiform Pregnancy.—The early signs of pregnancy follow impregnation as usual; but there are no positive or physical signs, for the child dies before the tenth week—often much sooner. Then follows extreme rapidity of uterine enlargement. At six months the womb is as large as a full-term pregnancy. It is unsymmetrical in shape; it is doughy or boggy to the touch, and no fœtus can be felt in it. Overdistention, between the fourth and sixth month, leads to contraction of the womb, accompanied with gushes of transparent watery fluid, from crushing and bursting of cysts. Hemorrhage—severe hemorrhage—may also occur.

Diagnosis is confirmed by finding characteristic cysts in the discharges, or the mass may have been previously felt in the os uteri.

Prognosis.—Generally favorable. The chief danger is hemorrhage. In rare cases rupture of the uterus may occur, with consequent hemorrhage into the peritoneal cavity, peritonitis, septicæmia, and death.

Treatment.—Empty the uterus and secure its contraction as soon as safely practicable. Give ergot. Open the os uteri, if necessary, with a Barnes' or other dilator, and with the fingers or hand, or half hand in the uterus, carefully extract the mass. *Beware of rupturing the uterine wall; it may be very thin.* While the os is dilating a tampon may be necessary to check hemorrhage. Instead of using the hand, the mass may be broken up with a male metal catheter, and left to be expelled by uterine contraction, especially when the os is undilated, a tampon being used to control hemorrhage.

In case the child is demonstrated to be alive (as in the rare instances of twins previously mentioned), an attempt may be made to control hemorrhage without emptying the uterus; but should this not succeed, and the life of the woman be jeopardized, the rule of removing the hydatidiform mass must be adhered to, whether the healthy ovum be disturbed or not.

After emptying the uterus its cavity should be washed out with a carbolic solution. If bleeding continue, tampon the

uterine cavity with iodoform gauze. To prevent recurrence of the growth, Dr. Barnes recommends painting the inside of the uterus with tr. iodin. one part, to glycerin five parts once a week for several weeks. Should there be any *offensive* discharge, wash out the uterus with some antiseptic solution and insert a suppository of iodoform.

In cases where a diagnosis has been made early in pregnancy, or even later, but *without any uterine contractions* or hemorrhage, it will be best (provided no evidence of a living child be present) to dilate the os uteri, bring on labor, and empty the womb, and thus avoid the danger of hemorrhage, which increases with the duration of pregnancy.

Moles.—Moles are masses of some sort, developed in and expelled from the uterus. If the growth result from impregnation, it is called a "*true*" mole; if it occur independent of impregnation, it is a "*false*" mole.

True moles: The hydatidiform pregnancy just described is a true mole. Another form—the "*fleshy mole*"—occurs after early death of the fœtus, from a sort of developmental metamorphosis of the fœtal membranes, mingled with semi-organized blood-clots, so as to form a more or less solid non-descript fleshy mass. Chorial villi may generally be discovered in it with the microscope.

Portions of the fœtal membranes, or of the placenta, may be left after abortion, and develop into true moles.

False moles: An intra-uterine polypus, or *fibroid tumor*, or *retained coagula of menstrual blood*, or a *desquamative cast of mucous membrane* from the uterine cavity (membranous dysmenorrhœa), may be expelled from the womb, with pains and bleeding resembling those of abortion or labor. Examination of the mass, its history, and absence of chorial villi, will be sufficient to indicate a correct diagnosis, and shield the female, if unmarried, from any undeserved suspicions.

A desquamative cast from the *vagina* may occasionally occur.

These are so-called false moles; they seldom attain any considerable size.

Treatment consists in securing their complete expulsion by ergot, digital manipulation, or curetting. In cases of fibroid tumors or polypi the usual surgical methods may be necessary for their removal.

Dropsy of the Amnion (Hydramnion, Hydramnios, Polyhydramnios).—The normal quantity of liquor amnii (one to two pints) may be increased to five, ten, and even twenty or more pints. This is *hydramnion.*

Causes, not thoroughly understood. In some instances the cause is interference with return of blood to fœtus through umbilical vein, either from pressure on the cord (as in twins or triplets) or from disease of fœtal heart, lungs, or liver obstructing circulation; hence association of hydramnion with syphilitic disease of liver of fœtus. Excessive secretion from the kidneys or from the skin of the fœtus. Acute cases sometimes follow blows upon the abdomen, with supposed inflammation of the amnion itself. Thinness of the mother's blood may produce it. There are numerous other theoretical explanations. It is seldom observed before the fifth month.

Symptoms.—Abdomen unnaturally large from overdistended uterus; increase in size and weight of the latter lead to dyspnœa and palpitation, vomiting, dyspepsia, insomnia, and œdema of labia and lower limbs, together with neuralgic abdominal pain, and difficult locomotion. In cases of *gradual* accumulation of fluid, these symptoms may be unexpectedly moderate. Very rarely the disease occurs in an *acute* form, with fever, *rapid* instead of gradual distention of the uterus, and consequent intense abdominal pain, extreme dyspnœa, cyanosis, and distressing emesis.

Hydramnion may lead to or be associated with ascites.

Diagnosis.—The uterine tumor will be found, on palpation, elastic and tense, with indistinct fluctuation, becoming more distinct as the distention increases. The fœtus is very movable, changing its position frequently; its heart-sounds are faint or inaudible. The history of pregnancy is an important element in diagnosis: it is sometimes overlooked. Twin pregnancy differs from hydramnios in presenting on palpation the solid irregular projections of the two fœtuses. An overdistended bladder is differentiated by the catheter. Distention of the abdomen from pregnancy associated with cystic tumor of the ovary or broad ligament differs from hydramnios in presenting two tumors of different shape and consistency. In any case where the abdomen is enormously distended almost to its utmost capacity, a positive diagnosis may be impossible without an explorative abdominal section, or reduction of the fluid by puncture.

Prognosis and Treatment.—Death of the fœtus and premature labor are apt to occur. One-fourth of the children are stillborn. Interference with respiration and other functions of the mother may endanger her life unless rupture of the sac occur spontaneously, or the fluid be discharged by *artificially* rupturing it, which is about all that can be done by way of treatment, and which, of course, ends the pregnancy. Attempts may be made to make only a small puncture of the amniotic sac high up between the membranes and uterine wall, so as to allow the fluid to run out gradually, and thus avoid premature labor. Tapping of the uterus through the abdominal wall, for the same purpose, has been repeatedly done, intentionally, in the interest of the child, and without any special harm to the mother, but the uncertainty of the child's life scarcely justifies the risk to her which is inseparable from such an operation.

When the fluid is suddenly evacuated apply abdominal bandage to prevent syncope from rapid reduction of intra-abdominal pressure. During labor beware of uterine inertia and hemorrhage, malpresentation, and prolapse of funis.

Deficient Liquor Amnii (Oligohydramnios).—In the absence of sufficient liquor amnii to distend the amnion and keep it away from the fœtus, adhesions may occur between the fœtal skin and amniotic membrane—they grow together. In case the deficient fluid is restored later, these adhesions may stretch into bands or cords, producing deformities of the fœtus or amputation of its limbs. Two limbs, in contact with each other, may grow together when there is not enough liquor amnii to separate them, and allow of their free motion. There is no *treatment.*

Hydrorrhœa (Hydrorrhœa Gravidarum).—During the latter months of pregnancy (sometimes earlier) women observe a discharge of fluid from the vagina—either a perceptible gush or a continuous trickle or dropping—which they think is due to rupture of the bag of waters; yet, on examination, the bag is found *un*broken. The discharge may occur during rest, as after exercise or violence. It is usually due to *catarrhal endometritis*—inflammation of the mucous lining of the uterus. The fluid resembles liquor amnii both in odor and color, but is sometimes muco-purulent or tinged

with blood. It accumulates between the chorion and decidua reflexa, until rupture of the latter membrane allows its escape, perhaps in quantities of a pint or less; or it may be formed chiefly by the decidua vera, and escape gradually between that membrane and the decidua reflexa. Obstruction to the outflow at the internal os uteri, or adhesions between the decidua vera and reflexa, may again cause accumulation of the fluid and its discharge in quantity later on.

The discharge is distinguished from that following rupture of the amnion in that the latter only occurs *once*, and is followed by labor. Rare cases are, however, recorded of *amniotic hydrorrhœa* in which the *amniotic fluid* has gradually escaped, at intervals, for weeks or months before labor, through an aperture in the amnion high up in the uterus, far above the internal os. In one case the amnion had been punctured by an ill-formed fœtal bone.

In any case, if the discharge be sudden and considerable in quantity, it may be followed by pain and premature labor. To prevent this we enjoin *absolute rest* and an *opiate*, taking care to avoid the mistake of hastening labor, under the impression that the waters have broken, when, really, they have not. By this treatment (there is no other), pregnancy may go on to full term. The catarrhal endometritis can, of course, only be treated after pregnancy is over.

CHAPTER XII.

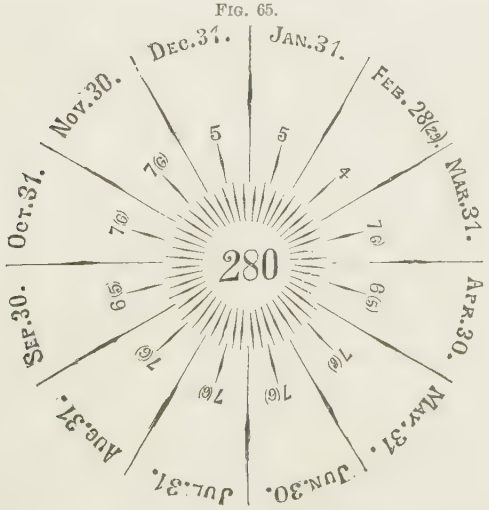
LABOR.

Labor is the act of delivery or childbirth—parturition. The period after impregnation at which it takes place is ten lunar months or thereabouts (280 days). Children may be born alive earlier, as already explained, and exceptionally, the pregnancy may last as long as eleven or even twelve months. The *possibility* of these latter cases becomes important, considered in a medico-legal point of view. For predicting the date of delivery in a given case there are several methods. The best is that of Naegele, to wit: (1) Ascer-

tain the day on which the last menstruation ceased; (2) count back three *calendar* months; (3) add seven days. For example: Menstruation ceased August 1st, count back three months—*i. e.*, to May 1st—add seven days, which brings us to May 8th, the probable day of delivery. It is the same as, but easier than, counting forward nine calendar months and adding seven days. To be *quite* exact, the number of days to be added will sometimes vary, as shown in the diagram constructed by Schulze. (See Fig. 65.) Thus, if after counting back three months we reach March, May, June, July, August, October, or November, the number of days to be added is *seven;* if April or September, *six;* if December or January, *five;* if February, *four*. Should the pregnancy include February of a leap-year, the figures contained in brackets are to be added, except when the counting back brings us into December, January, or February.

CAUSE OF LABOR AT FULL TERM.—A number of factors combine to provoke uterine contraction, chief among which

FIG. 65.



may be mentioned gradual distention of the uterus near the end of pregnancy (not before) from the organ having reached

the physiological limit of its growth, while the bulk of its contents still continues to increase.

Increased muscular irritability of the uterine walls and exaggerated reflex excitability of the spinal cord probably occur toward the end of pregnancy, so that the uterus is excited to contract more readily; while the stimuli to contraction, viz., distention, motions of the child, stretching of the uterine ligaments, pressure of the womb on contiguous parts from its own weight, and compression of it by surrounding peritoneal and muscular layers, are all exaggerated.

When the presenting part of the fœtus distends and presses upon the neck of the uterus, contractions are excited (just as the bladder and rectum contract when their contents press upon and distend their respective necks), but, in labor, this is *after* the beginning, hence irritation of the sphincter (os uteri) cannot be considered the *primum mobile* of uterine contraction.

Forces by which the Child is Expelled.—The main force is that of uterine contraction, which derives its power chiefly by reflex motor influence from the spinal cord; the secondary or "accessory" force is contraction of the abdominal muscles and diaphragm. Uterine contraction is entirely involuntary, that of the abdominal muscles may be assisted by voluntary effort in the act of straining.[1]

Labor Pains.—A labor pain is a contraction of the uterus lasting for a little time, and then followed by an interval of relaxation or rest. In the beginning of labor the pains are *short in duration* (thirty seconds or less); feeble in *degree;* the intervals are *long* (half an hour or more), and there is no contraction of the abdominal muscles, or straining effort. As labor progresses, in the natural order of things, the pains gradually increase in duration, strength, and the amount of straining effort, and the intervals between them become shorter, up to the moment of delivery. The longest pains seldom exceed one hundred seconds.

[1] The nervous origin of the motor power of the uterus is still unsettled. Playfair (6th American edition) affirms that the fact of the uterine contractions being altogether involuntary "proves them to be excited solely by the sympathetic system" (p. 271), and that the motor centre for uterine contraction "is known to exist in the *medulla oblongata*" (p. 267). Foster (Text-book of Physiology, 3d edition, p. 703) says: "The whole process of parturition may be broadly considered as a reflex act, the nervous centre being placed in the *lumbar cord.*"

The *early* pains are called "cutting" or "grinding" pains, from the accompanying sensations experienced by the woman; and the later ones "bearing-down" pains, from the distressing tenesmus or straining by which they are attended.

In cases where there is no malproportion between the size of the head and pelvis, and other things are perfectly normal, there are still two great sphinctorial gateways which offer a certain amount of obstruction to the passage of the child, and the resistance of which must be overcome before delivery can take place; these are: first, the *mouth of the uterus;* second, the *mouth of the vagina.*

THE "BAG OF WATERS."—A natural arrangement is provided for the dilatation and opening of the resisting os uteri, by the gradual forcing into and protrusion through it of the most depending part of the amniotic sac, or "bag of waters." During labor pains the contracting circular layers of uterine muscles compress the "bag" on all sides, circumferentially, thus tending to make it bulge out at the only point of escape, (the os uteri); while the longitudinal muscular layers in the uterine wall shorten the womb, and thus tend to pull back, or retract, the ring of the os from off the bulging end of the protruding bag. The bag, being soft, smooth, and elastic, can more completely fit and more easily dilate the os uteri than any part of the fœtus, hence the importance of not breaking it during the early part of the labor. The *weight* of the contained liquor amnii probably assists dilatation, the woman not being confined to a recumbent posture.

The bag of waters also protects the body of fœtus, placenta, and umbilical cord from the direct pressure of the uterine wall; and it allows the womb to maintain its symmetrical shape, thus lessening interference with the uterine and placental circulation.

LABOR IS DIVIDED INTO THREE STAGES.—The *first* stage begins with the commencement of labor, and ends when the os uteri is completely dilated.

The *second* stage immediately follows the first, and ends when the child is born.

The *third* includes the time occupied by the separation and expulsion of the placenta; it ends with safe contraction of the now empty uterus.

Premonitory Symptoms of Labor.—Sinking of the uterus, with consequent relief to cough, dyspnœa, palpitation, etc., as previously explained (pages 157 and 161). Increased frequency of evacuations from bowels and bladder from pressure on them of the now sunken uterus. Commencing and progressive obliteration of the *neck* of the uterus. Occurrence of a viscid mucous discharge from the vagina (originating, however, chiefly in the cervix uteri) which may be tinged with blood: it is called "*the show*." This last lubricates the soft parts and prepares them for dilatation.

Intermittent pain in the womb, due to feeble contractions, may occur a few days before the actual commencement of labor—sometimes weeks before.

Signs and Symptoms of Actual Labor.—The characteristic signs are: 1. Labor pains; 2. Commencing dilatation of the os uteri; 3. Presence, or increase if previously existing, of muco-sanguineous discharge—the "show;" 4. Commencing descent into or protrusion through the os uteri of the bag of waters; 5. Rupture of the bag and discharge of liquor amnii; 6. Relaxation of external genitals.

Phenomena of the First Stage.—Feebleness and infrequency of the first "cutting" pains. Suffering during them is referred chiefly to the back. The woman walks about, if not prohibited from doing so; is restless, despondent, perhaps slightly irritable from discontent at progress being slow.

As dilatation of the os uteri progresses the pains become "bearing down" in character, and the pain in the back increases in severity. Nausea and vomiting occur during further dilatation, and probably assist it by producing relaxation. When dilatation is near completion slight "shudders" or even severe rigors occur, but without any fever. Full dilatation of the os uteri is usually announced by rupture of the bag of waters during a pain and an audible gush of liquor amnii.[1] On vaginal examination we find simply progressive dilatation of the os uteri and protrusion of the bag of waters. The presenting part of the child may be felt through the unbroken sac. The duration of the first stages varies much

[1] By some authors, rupture of the bag defines the end of the first stage of labor; it may, however, precede dilatation.

in different cases; it is nearly always much longer than the other two stages combined. It is, indeed, a common observation that a longer time is required for the os uteri to dilate as large as a silver dollar than for all subsequent parts of the labor together. The first stage is usually longer in primiparous women, and still more so in primiparæ over thirty years of age. An os uteri that is soft, thick, and elastic dilates more readily than a hard, thin, rigid one. Premature rupture of the bag of waters greatly impedes dilatation.

PHENOMENA OF THE SECOND STAGE.—Tremendous increase in the frequency, strength, duration, and expulsive or bearing-down character of the pains. Nevertheless they are more contentedly borne, from (supposed) consciousness of progress on the part of the woman. The head of the child may now be felt descending into and beginning to protrude through the os uteri. It eventually slips through the os into the vagina, accompanied with renewed flow of some remaining liquor amnii. There may be a momentary pause in the suffering, and the woman may exclaim, "Something is come!"

The head now pressing upon sensitive nerves in the vagina elicits still more reflex motor power from the spinal cord, and the pains are still longer, stronger, more frequent, and expulsive. The corrugated scalp of the child, swollen and œdematous (constituting the *caput succedaneum*), successively approaches, touches, and begins to distend the vulva and perineum. The anus is dilated and everted, fecal matter is forced out, the perineum is stretched more and more until its anterior border is almost as thin as paper, and at last, in a climax of suffering, the equator of the head slips through the second sphinctorial gateway (the os vaginæ), and the head is born. A moment of rest may follow, and then, with one or two more pains, the body of the child is expelled, and the second stage of labor is over. The duration of the second stage largely depends upon the dilatability of the perineum. In a natural case, other things being equal, a soft, thick, elastic perineum, with abundant mucous discharge, and in a young and multiparous woman, will dilate sooner than when opposite conditions prevail.

PHENOMENA OF THE THIRD STAGE.—By the time the child is fully expelled the placenta is separated from the

uterine wall and lying loose in the now contracted uterine cavity. The womb may be felt as a hard, irregularly globular ball above the pubes. There may be an interval of one-quarter or one-half of an hour's rest from pains, if the case be left entirely alone. Then, sooner or later, gentle pains again come on, the placenta is doubled vertically, the fœtal surface of one-half in apposition with that of the other, and the organ protruded endwise into the vagina, from whence it is, by other slight pains, finally expelled, together with some blood, remains of liquor amnii, membranes, etc. The womb now contracts into a distinctly globular, hard mass, no bigger than a cricket-ball, thus effectually closing the uterine bloodvessels and preventing hemorrhage, which last is further stopped by coagulation of blood in the mouths of the open blood-channels. Thus ends the third stage of labor.

The average duration of labor in natural cases is about ten hours. It may be over in one or two hours, or last twenty-four or longer without any bad consequences.

Management of Labor. Preparatory Treatment.—In anticipation of approaching labor precautions against constipation, by mild laxatives (castor oil, manna, rhubarb) may be necessary to prevent fecal accumulation in lower bowel. Moderate exercise, as far as practicable in the open air, and cheerful social surroundings, to mitigate despondency. Physical and mental excitement must be avoided. Ascertain whether urine be voided freely; if not, use male elastic catheter.

Preparation for Labor and its Emergencies.—On being called to a labor case, the physician should attend *without delay*, and take with him *always* the following articles:

1. Compressed antiseptic tablets of bichloride of mercury.[1]
2. A pair of obstetric forceps.
3. Fluid extract of ergot, f℥ij.
4. Hypodermic syringe.
5. Hypodermic tablets of morphia, each gr. ¼.
6. A stethoscope.
7. Needles, needle-holder, and aseptic sutures.

[1] The tablets I use are those of Dr. C. M. Wilson, containing hydrarg. bichlorid. grs. 7.7, ammon. chlorid. grs. 7.3. Made by Wyeth & Bros.

8. Male elastic catheter.
9. A Davidson or fountain syringe.
10. Iodoform gauze.
11. Carbolic acid, ʒij.
12. Bottle of carbolized vaseline or mollin (5 per cent.).
13. Creolin, ʒij.
14. Sulphuric ether, Oss. This last, being bulky, may be omitted, if it can be obtained within easy distance of the patient.

Physicians do not generally carry all these things, and probably never will until compelled so to do, as they should be, by law. Most of the articles may be seldom wanted, but emergencies known to be probable should be anticipated. In addition to these articles carried by the physician, the nurse or patient should be instructed, before labor begins, to have ready also: a bed-pan; an abdominal binder; ligatures and scissors for the navel-string; a pint of whiskey or brandy; two or three rolls of antiseptic absorbent cotton; a feeding cup; antiseptic pads for the lochia; and plenty of clean towels, hot and cold water, and a paper of safety-pins.

Antiseptic Midwifery and Antiseptics.—At the present time no argument is necessary to accentuate the importance of a rigid antiseptic *technique* in the management of labor and in obstetrical operations and procedures of every kind. The antiseptic method has almost completely blotted out puerperal fever from lying-in hospitals, where, in former years, many women died from that disease. While in private practice, with normal hygienic surroundings, the mortality from septic infection, without antiseptics, may by accidental good luck be comparatively small, it is exactly this small mortality from which every woman ought to expect, and demand, protection at the hands of her medical attendant. When prophylaxis is possible, the liability to disease and death cannot legitimately be left to chance and luck.

The real reason why antiseptic midwifery has failed to receive in private practice the universal adoption which it deserves is not so much lack of belief in its efficacy, but lack of knowledge as to the method of procedure, difficulty in the selection of one method from many others, and patience in carrying out details of whatever plan may have been chosen. To facilitate and simplify the matter, the following directions may be of service.

Antiseptic Solutions.—Three antiseptics, now in common use, are *bichloride of mercury*, *creolin*, and *carbolic acid*. The stronger bichloride solution (1 : 1000) is made by adding about seven and a half grains of bichloride of mercury to one pint of water; most conveniently and more exactly done by using the compressed tablets now in the market, each containing 7.7 grains of the bichloride, *exactly* sufficient to make the 1 : 1000 solution. Of course, 1 : 2000 or 1 : 3000, and 1 : 4000 solutions are made by adding the same amount of bichloride to 2, 3, or 4 pints of water respectively.

The strong solution of *carbolic acid* (1 : 20, or 5 per cent.) can be made, approximately, by adding fʒvj (six small teaspoonfuls) of carbolic acid to one pint of water. This strong solution may be used to sterilize instruments, but a weaker preparation—ʒij to the pint of water—will be used for the vaginal or uterine douche.

Creolin does not dissolve in, but easily mixes with, water to form a milky emulsion, the strength of which, for douching, should be from 1 to 2 per cent.—*about* fʒj (or a small teaspoonful) to one pint of water.

Of these three the bichloride is the best germicide, especially for cleansing the external parts. Creolin is safer for the internal douching. Carbolic acid, in strong solution, for instruments. In making either preparation, use first a little *hot* water with the germicide, then add the required quantity later.

The antiseptic management of normal labor aims to *prevent* infection. This prophylaxis consists in thorough disinfection of the *patient*, the *physician*, and the *intruments* and *appliances* employed. The simplest method is as follows: The *patient*, at the beginning of labor, takes a tepid bath, and is well scrubbed all over with soap and water. Then an enema of soap and water to empty the bowel; after the action of which, the external genitals, thighs, buttocks, and abdomen are carefully washed with a 1 : 2000 bichloride solution, special attention being given to overlook no fold or fissure of the surface. Finally, the vagina is douched with a 2 per cent. creolin solution, or, in place of this, the 1 : 2000 bichloride solution. The *physician*, before making any examination or doing any operation, removes his coat, bares the arms to above the elbows, when the hands and arms are thoroughly scrubbed with soap, water, and a stiff nail-brush. Scrape the under surface of the nail-

ends and the fissures surrounding the nails, with some pointed instrument, not sharp enough to scratch, and having washed off all soap in some clean water, immerse the hands and lave the arms in a 1 : 2000 bichloride solution, and continue this last washing for three minutes. The *instruments* should be sterilized by immersion in a 5 per cent. solution of carbolic acid; some metals are corroded by the bichloride solution. Special care to be given in cleansing joints, fissures, and screws, and the nozzles of syringes. All soft textural fabrics—cotton, lint, etc.—to be sterilized in the bichloride (1 : 2000) solution and wrung out, before coming in contact with the genitals. *Sponges* should be abolished from the lying-in room; it is almost impossible to disinfect them.

It is needless to add that any *sutures* used (as in sewing up a perineum, etc.) must, of course, be *aseptic*, as in any other surgical operation; and *nurses* must be subjected to the same disinfection as the physician. Rubber cloths and oiled muslin or silk may be sterilized by rubbing them with the bichloride solution—1 : 2000.

The details of antiseptic *technique*, during the several stages of labor, obstetrical operations, and the puerperium and its diseases, will be given in their appropriate places.

Examination of the Patient.—1. Verbal examination, in as gentle and pleasant a manner as possible, into the child-bearing history of the patient, as to number (if any) of previous labors; their character, duration, and complications (especially as to flooding after delivery). Did the children survive? Symptoms during present *pregnancy*, if not already ascertained. Has it reached full term? Present symptoms of labor? Pains—their frequency, severity, character, and duration? Character of the flow? Has the bag of waters broken?

2. Abdominal examination, to ascertain, by palpation and inspection, the size and shape of the gravid uterus, the presentation and position of the child, and the existence or otherwise of multiple pregnancy, complicating tumors, hydramnios, etc. On *inspection*, the practiced eye readily appreciates any marked departure from the usual symmetrical form and ordinary size of the normal gravid uterus; also decided malformations of the woman's shape, indicating pelvic deformity. The greater width of the abdomen, in a transverse

or oblique direction, visibly suggests shoulder presentation. Suspicions aroused by inspection to be confirmed, or otherwise, by *palpation.*

The *methods of palpation* here given relate only to normal cases of head presentation.[1] The woman lies upon her back, the lower limbs straight out, and the feet slightly separated, or partially flexed with the heels together: if *completely* flexed the thighs come in contact with the enlarged abdomen and obstruct the examination. The bladder and rectum must be empty and the abdomen bare, except perhaps one layer of some thin fabric. The manipulations to be practiced *only* in the absence of uterine contractions—between the pains.

The educated hands or fingers will recognize the following characteristics of the several parts of the child:

a. The *head:* it feels *hard* and *globular*—there is nothing else like it—if not engaged in the pelvis it may be made to swing or move from side to side between the hands—a real ballottement.

b. The *breech:* it feels *soft* and *irregular*—quite different from the cranium.

c. The *back:* it feels like a *firm resisting plane* surface, or one side of a long cylinder.

d. The *abdomen:* the abdominal aspect of the child is covered by the extremities and liquor amnii; hence it feels *soft*, *elastic*, and *un*resisting, with *irregular projections* (the upper and lower limbs), which may move actively or be moved by the examiner—very different from the firm, resisting plane of the child's back.

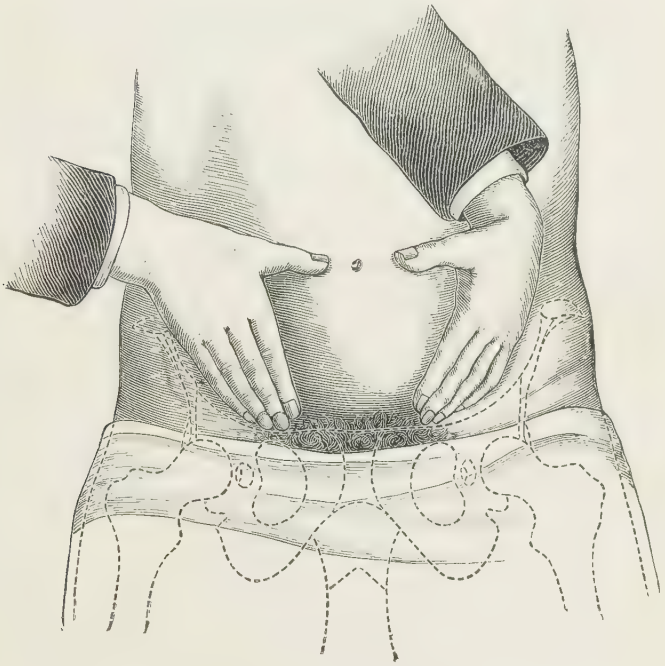
e. The *forehead* and *occiput:* the head being usually *flexed*, the occiput will be tilted *down toward the pelvis* and its *posterior projection reduced* almost to a continuation of the plane surface of the back and nape of the neck; hence the examiner's fingers reach it with difficulty or fail to touch it at all; while the *forehead*, being *tilted upward* and *forward* toward the anterior plane of the child, becomes *more prominent*, and is *easily recognized*—it feels *harder, larger,* and *higher* above the brim than the occiput.

f. The globe of the presenting head may be *above the pelvic brim*, or may have *descended*, more or less, into the *pelvic*

[1] Palpation in other cases will be considered in relation to the *diagnosis* of the several presentations and abnormal complications.

cavity. In the former case the examiner's fingers dip below the brim, and find the pelvic excavation empty; in the latter case, descent of the head into the brim fills the space, and the fingers *cannot enter* the inlet of the excavation. If, *before labor*, or during *its beginning*, the presenting part descend into the excavation, it is a *head* presentation: no other presentation will do this.

FIG. 66.



Palpating head in lower part of uterus.

In palpating the abdomen experience has demonstrated the following series of successive manipulations to be advisable:

First. The examiner, being at the side of the patient and facing her, places the palms of both hands *across* the abdomen above the umbilicus—the finger-tips of one hand touching those of the other—then glides the hands upward with gentle

pressure until their cubital borders sink in above the fundus uteri, thus defining the height of the latter—its nearness to the ensiform cartilage—and the probable duration of pregnancy. The hands also recognize the head or breech occupying the fundus; or their absence, indicating a transverse or oblique presentation. This examination may also be done with *one* hand. (See Fig. 60, p. 123.)

Second. Both hands, being used as in the last manipulation, now separate from each other, and the palms pass to the *sides* of the uterus, where *one* feels the smooth resisting plane of the child's back, the *other* the irregular projections of the extremities over the child's abdomen.

Third. One hand only is used: it is placed *across* the lowest part of the middle of the abdomen just above the pubes, its ulnar border being toward the mons veneris; the thumb on one side and finger-tips on the other then attempt to grasp bodily the presenting head, its hard consistency and defined globular shape being easily distinguished from the ill-defined outline and softness of a breech case. The hand may be placed higher or lower, according as the head has or has not descended into the pelvic excavation. In either case the *forehead* will be more prominent and more easily recognized than the *occiput*, as already explained.

Fourth. Instead of the *third* manipulation just previously described, the following method may be used:

The examiner, standing with his back toward the patient's face, places his hands on the abdomen, about four inches apart, so that the finger-tips touch the upper margin of the pubic rami, while the thumbs point toward each other at about the level of the umbilicus. Now let the finger-ends push before them a shallow fold of the abdominal wall down between the presenting head and posterior aspect of the pubic bones near the ilio-pectineal eminence. The finger-ends thus actually enter the pelvic brim *below* the head, if the latter have *not* descended into the excavation; or, if the head *have* so descended, the fingers cannot enter, but recognize the head obstructing their passage through the brim, the more prominent *frontal* region being recognizable as offering *more* obstruction to the hand on *that* side of the pelvis than is offered by the pole of the occiput on the *other* side, where the finger-ends can penetrate a little deeper. If the abdomen sag forward, it may with the palms of the hands be lifted up a little out of

the way, and thus facilitate the entrance of the fingers below; and, if the abdominal wall be tense, this may be partially relieved by the lower limbs being slightly flexed, with the knees apart and heels together.

FIG. 67.



Palpation with head in pelvic cavity: fingers toward the occiput enter deeper than those toward forehead.

The *presentation* of a head having been demonstrated by these manipulations, the *position* of the occiput will be also known by observing where the *back* is, and whether the prominent *frontal* region be directed *anteriorly* or *posteriorly*, to the *right* or to the *left*. With the abdominal examination may be

included external pelvimetry (which see). Every pregnant woman should have her pelvis measured early in gestation. If previously omitted, it should be done later, either before or during labor.

3. Vaginal examination. To the young practitioner, who may experience some embarrassment with his first vaginal examination, the following suggestions may be of service:

In labor cases it is *not* necessary to obtain *verbal* consent of the patient before instituting the examination. Proceed (the woman being in bed) without hesitation, as if consent had already been obtained. Having been sent for to attend her is a sufficient guarantee of this. If anything is to be *said* on the subject, some such remark as "Well, we'll see how you are getting on"—suiting the action to the word—will be amply sufficient; or a simple inquiry as to the convenience of soap, water, and towel may be enough to introduce the subject and indicate one's purpose. The less said the better. Proceed, *without hesitation*, just as in feeling the pulse. Should the woman cry, demur, and declare she cannot submit to the examination, proceed just the same, meanwhile addressing to her any kind word of encouragement that may serve to lessen fear or embarrassment. Nothing but *physical* resistance on the part of the woman should induce the physician to give up the examination. This will seldom occur; when it does, there is nothing to do but withdraw from the case, or the announcement of this *intention* will generally remedy the difficulty.

Should the patient be dressed and sitting up, she must be requested to go to her room and lie down in order that the examination may be made. Instruct the nurse to place her near the edge of the right side of the bed, that the right hand may be conveniently used. The physician to be notified when she is ready.

Position of the Woman.—On the back, with the knees flexed, is the obstetric position most common in the United States. Some practitioners prefer the English position, the woman lying on the left side near the right edge of the bed, with her knees drawn up.

Introduction of the Finger.—After proper disinfection (see pp. 202, 203), anoint the right index finger with carbolized vaseline (or mollin), 5 per cent., or some other aseptic lubricant.

Fold it toward the palm, and with the thumb and middle finger shield it from greasing the bed-clothing (which must be previously loosened or untucked) while reaching the vulva. Pass the hand under—never over—the thigh, the knees having been previously flexed; separate the labia, and introduce finger rather toward posterior than anterior commissure, with care to avoid inverting any hair. The index finger will reach higher in the vagina if the remaining fingers are (not doubled into the palm, but) stretched out over the perineum so that the posterior commissure fits into the deepest part of the space between the index and middle fingers. The perineum may be thus pushed in, or lifted somewhat upward and inward, when there is any difficulty in reaching the os uteri. In case the index finger will then not reach far enough, it and the middle finger may both be introduced together.

PURPOSES OF VAGINAL EXAMINATION.—By this examination we learn:

1. The condition of the vagina and vaginal orifice as regards their patency and freedom from obstruction to the passage of the child; also their temperature, sensibility (freedom from tenderness), and moisture.
2. Corroboration of the existence of pregnancy if not previously ascertained by physical proof.
3. Condition of the os uteri—its *degree of dilatation*, thickness, consistency, and elasticity.
4. If labor have actually begun.
5. To what stage it has progressed.
6. Whether the bag of waters has ruptured.
7. What the presentation is.
8. The condition of the pelvis, whether normal or deformed.
9. The state of bladder and rectum as to distention with their respective contents.

When accustomed, by practice, to the examination of *normal* vaginæ, pelves, etc., the existence of any *abnormality* is readily appreciated by the finger without any particular attention being given to each of the details just enumerated. In commencing practice, much more care is necessary to avoid overlooking existing departures from the natural state.

In learning the degree to which the os uteri is dilated, it is the size of the *circular rim* (or lips) *of the external os* that we wish to ascertain. Without care the finger may be passed

through a *small* os uteri and swept round a considerable surface of the presenting part or amniotic sac, thus conveying an impression that the os is dilated when it is not. Finding a small, hard, easily movable uterus, *per vaginam*, at once negatives the existence of advanced pregnancy, unless it should happen to be an extra-uterine case. A pregnant woman may imagine herself in labor when she is not, owing to the occurrence of "*false pains*." These, on vaginal examination, are found to be *un*accompanied with dilatation of the os and cervix uteri; they produce no tension or prominence of the bag of waters; nor are they preceded with the premonitory symptoms of labor; they are irregular in their occurrence, and do not increase in severity or frequency like true pains. False pains produce uneasiness in the abdomen; early true ones extend to the lumbar and sacral regions. False pains are generally produced by some source of irritation in the intestinal canal, and are usually relieved by a laxative, an opiate being given after its action. The diagnosis of a head presentation may be made out even before the os is dilated. The hard, smooth globe of the head may be recognized through the wall of the uterine cervix. There is nothing else like it. Generally the os will admit a finger, when the cranium, if not too high up, may be readily felt, covered by the membranes. It is not always easy to ascertain whether the membranes have ruptured. Statements of woman or nurse are not reliable. If there be a layer of liquor amnii between the head and membranes, the space and fluid may be readily recognized by gentle pressure with finger *between the pains*. Not so when the membranes closely embrace the head. Then feeling the child's hair, and corrugation of the scalp during a pain, show the bag has broken. The membranes, on the contrary, become smooth and tense during a pain, possibly wrinkled a little in the intervals.

Opinion as to Time of Delivery.—After one examination only, no opinion as to the duration of labor can be confidently formed, certainly none should be expressed. Having felt the head, we may say "everything is right," and encourage the woman not to despond. After a second examination in twenty or thirty minutes, we may *form*, but should not express, an approximate idea as to time of delivery, by degree (if any) of progressive dilatation that may have taken place.

Preparation of the Woman's Bed.—Let it be anything rather than a feather bed—a firm mattress is best. Place it so as to be approachable on both sides. Cover it with a rubber sheet, and over this an ordinary bed-sheet. Fasten these two to the mattress with safety-pins; they are *not* to be removed after labor, but over them are placed a second rubber sheet and a second ordinary sheet, fastened in the same manner, which *are* to be removed after labor, leaving the first set clean and dry. The ordinary sheet of the second set should be turned down from above until the line of fold is below the woman's shoulders (the rubber sheets need only cover the lower two-thirds of the mattress), in order to facilitate its withdrawal from below, when labor is over. During labor, a pad about three inches thick, and two or three feet square, is placed upon the second sheet, beneath the woman's hips, to receive all discharges. It may be made of folded sheets, or a soft blanket, or, still better, of oakum, jute, cotton, or some other absorbent material, packed in a cheese-cloth bag of proper size. All materials, blankets, and sheeting to be *thoroughly sterilized* before being used. When labor is over, the upper rubber cloth (No. 2), with its soiled sheet and soddened pad, may be easily dragged off at the foot of the bed, leaving the patient resting upon the dry sheet (No. 1) first placed over the rubber cloth (No. 1) fastened to the mattress.

Instead of the absorbent pad, the caoutchouc pad, devised by Dr. H. A. Kelly, may be used. It not only protects the sheets, but conducts discharges over the side of the bed into a vessel on the floor.

Arrangement of the Night-dress.—Its skirt should be rolled up to the level of the armpits or a little lower, so as to be out of the way of vaginal discharges, while a thin petticoat or light flannel skirt covers the parts below the waist. When labor is over the soiled skirt may be readily removed over the feet, without lifting the patient, and the dry night-gown then pulled down from above.

Is it Necessary to Keep the Patient in Bed during the First Stage?—No. Let her sit, walk, or change her position as she desires, until the bag of waters is about to break, when recumbency is desirable to prevent washing down of the umbilical cord by the gush of liquor amnii, and for other reasons.

Rupture of the Bag of Waters.—Just *before* rupture the woman should be told what is going to happen, to prevent alarm, especially if she be a primipara, and an extra cloth or piece of blanket may be placed under her, to soak up the bulk of the flow. Just *after* rupture a vaginal examination should be made to ascertain more surely the presentation, and that no change has taken place in it, and the sutures and fontanelles may now be felt, and the "position"[1] of the head made out. The extra cloth may be removed at once.

Number of Attendants.—It is not desirable for the physician to remain in the lying-in room during the first stage of labor. After having seen that every preparation has been made, and having expressed a willingness to be called at any time the woman may desire, let him retire to some other apartment. One nurse is necessary, and an additional attendant or relative not objectionable, but no others. The husband may be present or not, as the wife may prefer.

Precautions during Early Stage.—If the rectum be loaded, administer an enema of soap and water to empty it. See that the bladder empties itself. If not, use a catheter. Protect the female from a glare of light, whether by day or night. Keep the temperature of the room at 65° or 70° F., if practicable. Instruct the patient *not* to strain or bear down during first stage; it does no good, and tires her.

Pinching of the Anterior Lip of the Os Uteri.—As the head passes out of the uterus into the vagina the lower margin of the os uteri slips up out of reach of the finger, but sometimes the anterior lip of the os gets pinched between the child's head and pubic bones so that it cannot slip up. It may then become greatly swollen, congested, and œdematous. *Treatment:* push it up with the ends of two fingers, between the pains, and hold it there till the next pain forces the head below it.

Cramp in the Thighs.—Painful cramps along the inner side of the thighs may occur from pressure of the head—

[1] "Position," in obstetrics, means the positional relation existing between a given point on the presenting part and certain fixed points on the pelvis. There are several "positions" to each "presentation," as will be explained hereafter.

probably upon the obturator nerve, or upon the sacral nerves —while passing through the pelvic canal. *Treatment:* empty the bowel by an enema; use manual friction upon the painful part; and hasten delivery by forceps, if necessary.

The perineum will usully require attention to prevent rupture. There is no fear of laceration so long as the anterior border of it maintains any considerable thickness and is not fully on the stretch during the pains. Hence, no "support" is necessary, and nothing is required but to watch the progress of the head (now easily touched inside the vulva), and ascertain when the perineum *does* become thin and tightly drawn out over the advancing head, and when there *is* danger of laceration, especially if the labor progress *rapidly*. *Treatment:* ask the woman to refrain from bearing down, from holding her breath, pulling with her hands, pushing with her feet and knees, etc. If unable to control her straining, anæsthetize her. The *methods* of manipulation to prevent laceration of the perineum are almost too numerous and varied to mention, but the *principles* involved (which it is most important to understand) are few, and always the same, viz.: 1. Give the perineum time to stretch, by retarding expulsion of the head—especially by retarding "*extension*." 2. Guide the head so that it may occupy as little space as possible, by keeping the plane of its smallest circumference parallel with the plane of the perineal ring through which it must pass; or, what is the same thing, keep the long diameter of the head at right angles to the plane of the perineal girdle: the central point of the occiput must lead—go first—and keep in the centre of the ring. 3. Relax the perineum as much as possible by gathering in tether from surrounding tissues—"give it rope" from the outside.

The manipulation may be accomplished either with the woman upon her left *side*, or in the *dorsal* position, provided the lower limbs be not forcibly flexed or widely separated, and for which there is no necessity. Unreserved *ocular inspection* of the parts is absolutely required. Note especially that rupture usually occurs *at the moment* or *during the few moments of the last one or two pains*, just as the head is being extruded. Normally the head is delivered by "extension" (see Mechanism of Labor, Chap. XIV.), the occiput rising over the mons veneris, while forehead, face, and

chin successively emerge at the perineal margin. Hence, to retard expulsion (which may be done *directly* by pressure upon the central occiput), we must *retard extension* by pressure transmitted through the perineum upon the frontal bone (the forehead), which *indirectly* retards expulsion. Extension *must* occur eventually or the child could not well be born; our purpose is to *delay*—not prevent—it. When the perineum has had time to stretch, we permit extension and consequent expulsion to take place.

In the manipulation to carry out these purposes, both hands are simultaneously used (the woman being either upon her side or back—preferably the former), as follows: The right hand is so placed that its fingers rest upon the posterior part of the left labium pudendi, and the thumb upon the right labium, the web of skin between the thumb and index finger being about in line with the perineal margin. The left hand is passed down over the abdomen and mons veneris until its finger-tips come in contact with the occiput just beginning to protrude between the labia. During the pains the fingers of the left hand make direct pressure upon the advancing occiput in line with the long diameter of the head, to stop it from coming out, while the fingers and thumb of the right hand gather in perineal tissues from the sides, thus relaxing central tension, while at the same time they—aided by the palm and ulnar border of the hand—transmit a deeper pressure through the perineum upon the forehead, to *retard extension;* meanwhile the manipulation unavoidably pushes the entire head up toward the pubes, thus utilizing any spare space left between the pubic arch and back of the child's neck. During these proceedings the parts should be swabbed occasionally with a hot solution of bichloride or a pledget of aseptic cotton, and the hands of the operator washed in a similar fluid. When it is finally deemed advisable to allow the head to escape, let this occur, if possible, *between* the pains.

Other methods of manipulation—the objects and principles of which will be the same as already described—are the following: (1) Place the thumb upon the advancing occiput and two fingers (of the same hand) *in the rectum*, by which the forehead is kept from extension and the perineum relaxed by lifting it up toward pubes during the pains (Goodell); (2) standing behind the woman (while she lies upon her left side) apply two fingers of the right hand to the occiput and pass the thumb into the

rectum, and thus hold back the head during pains (Fasbender); (3) place the thumb and index finger on each side of the perineum and gently push it forward and upward during pains, while expulsion is retarded by direct pressure upon the occiput (Playfair). To get out the head *between the pains*, upward and forward pressure may be made with the thumb or fingers in the rectum, upon the face or chin; or pressure *upon the outside*, behind the anus, close to the coccyx, may be made upon the forehead, provided it have descended low enough for this purpose: thus the head is forced forward and out over the pubes, between the pains, at the will of the operator. In forceps cases the head may be forcibly restrained, guided, and admitted to pass at will, by the action of the instrument.

The rectal manipulations—at best inconsistent with rigid antisepsis—require extreme cleanliness.

In cases where, despite these manipulations, rupture appears inevitable, the operation of *episiotomy* may be performed. The resisting ring of tissue being recognized by the finger just inside the perineal margin, a probe-pointed curved bistoury, or tenotomy knife, is passed in flatwise between the head and vaginal wall, at a point about one-third of the distance from the posterior commissure to the clitoris; then the edge of the knife is turned outward toward the vaginal wall, and an incision made about half to one inch long and one-fourth of an inch deep. The skin may or may not be cut by the incision. The *direction* of the cut (when the parts, of course, are distended) should be "up and down"—that is, parallel with the long axis of the woman's body. It may be done on both sides. After labor the wounds are stitched up with fine aseptic catgut. It is not often resorted to, and its alleged extraordinary good results are not always realized.

Should the perineum escape rupture during delivery of the head, it may yet be torn during the passage *of the shoulders*. This may be prevented by lifting the head and neck up toward the mons veneris, so that one shoulder goes back behind the symphysis pubis, while the other escapes at the coccyx. This enables one shoulder to be born at a time, and produces less strain upon the perineum than when both are pulled out together, and with rude haste, which must be avoided.

Birth of the Head.—When the head is expelled, feel with the finger if the umbilical cord encircle the child's neck.

If so, draw down the cord from whichever direction it will most freely come, and pass the loop of it thus formed over the head. See that nothing impedes the further free motion of the head. Keep one hand on the womb, and, by gentle pressure follow down its decreasing size, so as to assist its contraction and prevent hemorrhage. Support the head in the other hand, and, as another pain or two expels the shoulders and body, gently lift it in a direction continuous with the axis of the pelvic curve—*i. e., slightly* upward. No traction is necessary generally; and though the child's face begin to get bluish, there is no necessity for haste, nor fear of suffocation, even though delayed several minutes, which it rarely will be, before complete expulsion. *After expulsion of the child*, cleanse its nostrils and mouth from mucus, etc., and see that it breathes. If it do not, slap the buttocks (not roughly), rub the spine, dash a little water in the face or on the chest, which will generally suffice in an ordinary case. When respiration is established, let the infant rest on the bed between the thighs of the mother, preferably on its right side or back, avoiding contact with discharges, while the navel string is attended to. No haste is necessary in tying and cutting the cord, unless relaxation of the uterus, flooding, or some other condition of the mother, require immediate attention from the physician.

In the absence of any such emergency, it is best to wait until pulsation in the cord has ceased or become almost imperceptible.

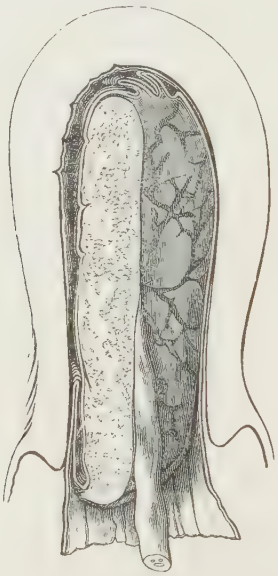
Management of the Navel String.—Ligatures—previously prepared by taking three or four feet of strong undyed thread, doubling and redoubling it, twisting it into a string, and tying a knot at each end—or suitable lengths of suture silk, narrow bobbin, etc., rendered aseptic by immersion in the bichloride solution, should be in readiness. Cut the cord with scissors one and a half inches from the umbilicus. Pinch the stump of the cord near its root with the thumb and finger of one hand, and with those of the other squeeze out of its distal extremity, by a sort of milking process ("stripping"), any excess of Wharton's gelatin, and tie it near the end tightly, but not tight enough to wound the bloodvessels. If the end bleed, put on another ligature just above the first one. There is no necessity for putting a ligature upon the placental end of the funis, unless twins be suspected, when it should be done.

The custom of leaving the stump of the funis one or two inches long was adopted to prevent ignorant persons from including the (not uncommon) protruding gut of an umbilical hernia in the ligature. When certain that no such hernia exists, the stump might just as well be cut off half an inch from the skin: such a practice has been recently recommended in the interest of antisepsis—it leaves less dead tissue to separate. Ascertain the sex of the infant; examine it for deformities or malformations; give it to the nurse, who holds a warm flannel or blanket for its reception; and caution her to let no strong light glare in its face, and to get no soap in its eyes. Under circumstances and places in which the child is exposed to the infection of ophthalmia neonatorum, the eyelids should be carefully washed externally with clean warm water, and, from the end of a glass rod one drop of a nitrate of silver solution (strength 1 : 50) should be dropped on the cornea of each eye immediately after birth.

Delivery of the Placenta.—The child having been disposed of, place a hand upon the fundus uteri. If it be found symmetrical in shape, and as small in size as a cricket ball, the placenta is probably resting loose in the vagina. If it be larger than this, and not so symmetrically globular in shape, the placenta is most likely still in the womb, or half in and half out. In this latter case manipulate the fundus and make pressure upon it to excite contraction, meanwhile asking the woman to bear down when she feels the pain begin. Should there be any bleeding, the fundus may be grasped firmly by the hand, and the placenta literally squeezed out of the uterus into the vagina, after the manner of Credé. To be successful in this manœuvre, the uterus must be grasped bodily by the thumb and fingers so that the fundus rests in the palm, and firm pressure made only *during uterine contraction*—at the *height* of a labor pain. *Both* hands may be used, the eight fingers going behind the uterus, the thumbs in front. Hold the womb continuously, but less firmly between the pains, and resume strong pressure as the pain returns, and so on for six or seven pains if necessary—the *direction* of pressure being downward and backward in line with axis of uterus. (See Fig. 69.) When the placenta has passed entirely through the os uteri into the vagina, it is easily extracted by hooking into it one or two fingers and making traction. When it is

only half-way through the os, the index and middle fingers are passed up to it, following the cord for a guide, and the organ being grasped between the finger-ends, it is made to bulge completely through the os by directing traction *backward* toward the sacrum, the other hand compressing the fundus, and the woman being told to bear down. Never, under any circumstances, make traction on the cord. It tends to pull the placenta flatwise (like a button in a button-hole), thus

FIG. 68.



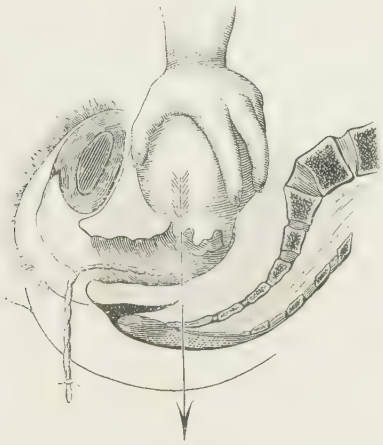
Normal doubling of placenta. (After DUNCAN.)

obstructing its egress, and might, if the placenta were still adherent, invert the womb. When undisturbed by traction on the cord placenta will be folded vertically, in the line with the long axis of the womb, as shown in Fig. 68.

In normal cases it may be possible to deliver the secundines by external pressure alone, and without using a finger in the vagina, and in the line of rigid antisepsis this is advisable. It is not necessary to hurry the delivery of the placenta imme-

diately after the infant's birth: an interval of fifteen or twenty minutes gives time for coagula to form in the mouths of the uterine bloodvessels, and thus contributes to prevent hemorrhage. The practice of giving *ergot* to expedite expulsion of the placenta has been abandoned. It may, however, be given, and with advantage, to secure firm uterine contraction, after the placenta is expelled; the dose being ʒss to ʒj of the fluid extract.

Fig. 69.



Expression of the placenta. (Credé.)

As soon as the organ has passed the vulvar orifice, hold it there, close up, and with both hands twist it round and round, always in one direction, and the membranes will thus be twisted into a sort of rope, which gradually gets longer and narrower until terminating in a mere string, which finally slips from the vagina, and delivery is complete. If this twisting device be not adopted a part of the membrane is likely to remain, and, becoming entangled with clots of blood, cause after-pains, and come away, fetid, days afterward, not without alarm to the patient.

After delivery the placenta should be inspected to see that no part has been torn off and left behind, and then deposited in the vessel held by the nurse for its reception.

Firm contraction and retraction of the uterus having been secured, the third stage of labor is over. It remains to make the woman aseptically clean and comfortable. The soiled sheets and pad are removed; the nurse cleanses the skin from blood-stains with a bichloride solution, dries it with a clean towel, puts under the hips a clean, dry draw-sheet, and the patient is now ready for the binder and vulvar dressing.

A mild bichloride solution (1 : 4000) should be used to wash out the *vagina* before the dry dressings are applied. It is *not* necessary or desirable to wash out the *uterus* in a normal case.

The Binder is an abdominal bandage designed to support the stretched walls of the abdomen and compress the uterus so as to prevent its relaxation and consequent hemorrhage. It gives the woman comfort, and prevents syncope. It scarcely improves her figure as was once supposed.

It may be made of strong unbleached cotton or jean, and must be wide enough to reach from *below the projecting trochanters* (otherwise it will slip up) nearly to the ensiform cartilage, and long enough to go once around the body and overlap enough for fastening with strong "safety-pins." Let there be no creases under the back. Pin it, from above downward, where the ends meet in front of the abdomen, as tight as may be comfortable. Some prefer to pin it from below upward.

Another method of applying the binder is to pin it at first loosely with ordinary pins put in transversely half an inch apart along the median line, and afterward tighten it around the narrower part of the waist by gathering in a fold on each side of the body, these folds being retained in place by safety-pins longitudinally applied.

An antiseptic pad (preferably made of sterilized jute or absorbent cotton, wrapped in cheese-cloth), two inches thick, four inches wide, and ten inches long, is applied to the labia to receive the lochial discharge. In the absence of such a pad a perfectly clean, aseptic napkin may be used. They are kept in place by being fastened to the binder above and below. The pads are to be removed and burned as often as may be necessary from the amount of discharge.

A more perfect antiseptic method—the so-called "occlusion dressing"—is the following: A piece of lint, 12 x 8 inches in size, is soaked in and wrung out of a 1 : 2000 bichloride solu-

tion. It is folded in the middle lengthwise, and then folded again, which makes it three inches wide and four layers thick. This is applied directly to the vulva. Over it is placed a piece of aseptically clean oiled silk or muslin, four inches wide and nine inches long. Again over this comes a large pad of cotton batting, the whole being kept in place by a square half-yard of muslin, folded like a cravat, each end of which is fastened to the abdominal binder. The dressing is changed every six hours, and the external genitals are laved with bichloride solution before a new one is put on.

Before any dressing is applied, the perineum should be examined, *in all cases by ocular inspection*, for laceration. If any be found it should at once be repaired by sutures of aseptic catgut. Catgut sutures require no removal: they may be left to digest in the tissues and come away of themselves. The sutures may be *passed* before the placenta is delivered, and *tied* after its delivery. The parts are less sensitive immediately after labor, and the anæsthesia produced during delivery still remains.

Attentions to Newborn Child.—The nurse anoints it with olive oil, and then washes it with mild soap and water, to remove the *vernix caseosa*—an accumulation of whitish sebaceous matter—from the skin, especially plentiful about folds and creases. It is most abundant in over-long pregnancies.

Dressing the Stump of the Cord.—It is an old *custom*, still prevailing, to draw the sump of the funis through a hole made in the centre of a bit of greased rag, then fold the borders of the rag over, and after laying it upon the abdomen with the end downward, place one or two belly-bands round the child to keep it in place. It is an abominable practice. If there be no defective development of the abdominal walls, the infant needs no artificial support by belly-bands (they are often applied painfully tight), and the cord itself only requires to be dusted with some antiseptic powder (salicylic acid one part, starch ten parts) and wrapped in a bit of antiseptic cotton to absorb its moisture and prevent sticking to the clothing. The stump falls off in *about* five days, more or less. A light flannel bandage may surround the abdomen *loosely* for the sake of warmth.

CHAPTER XIII.

MANAGEMENT OF MOTHER AND CHILD AFTER DELIVERY.

The condition of being in "child-bed," whether during or shortly after parturition, is known as the "Puerperal State" (from "*puer*," a child, and "*parere*," to bring forth). The term, however, is generally restricted to a period of four or five weeks immediately *following* the completion of labor. Hence certain diseases following labor are called "*puerperal*" fever, "*puerperal*" peritonitis, etc. The woman is spoken of as the "*puerpera*," and the condition or period as the "*puerperium*," or "*puerperality*."

The more serious puerperal affections — not of frequent occurrence—will be reserved for a future chapter.

At present only the more trivial and common accompaniments of lying-in will be considered.

General Condition of Lying-in Women.—A moderate amount of fatigue, exhaustion, and nervous shock follows every labor, being more marked in long and painful ones. In normal cases, rest and the mental stimulus of joy that a child is born into the world, and that the trouble is over, afford an adequate antidote.

The pulse, after delivery, diminishes in frequency, dropping to 70, 60, 50, or even lower. A slow pulse is of favorable augury—not so a frequent one. A frequency of 100 or more per minute indicates the occurrence of post-partal hemorrhage. In such cases the physician should not leave the patient.

The temperature slightly rises, within twelve hours, and may remain somewhat elevated for five or six days. Lusk and Schröder consider 100½° within the normal limit during this time. The temperature remits, being highest about 5 P.M., and lowest about midnight—11 P.M. to 1 A.M. The rise of temperature is more pronounced in those delivered in the forenoon, or within twelve hours preceding the regular evening exacerbation. The temperature should be taken, or the temperature chart taken by the nurse examined, at every visit.

Owing to a difference of temperature between the blood in the internal organs and that in the skin, which occurs just after the birth of the *child* (and before the placenta is expelled), due to evaporation of sweat, exposure of the skin, and cessation of muscular effort, the woman may be seized with rigors (chilliness, trembling, chattering of the teeth, etc.) —the so-called "*post-partum chill.*" It passes off in a few minutes without any ill effects, under the application of warm clothing, and, perhaps, a glass of wine.

THE LOCHIA—LOCHIAL DISCHARGE.—It is a discharge from the uterus following labor, consisting during the first two or three days of blood, mixed with mucus, serous fluid, and remnants of decidua. The red (blood) color gradually changes to a yellowish or pale green tint, and the flow is thinner and less in quantity. It continues to diminish in quantity, consistency, and color, becoming at last serous or watery, ceasing altogether in two, three, or four weeks, varying in different cases. Examined microscopically, it is seen to contain, at first red and white blood-corpuscles, various kinds of epithelium cells, decidual and placental débris, etc. After a week or two, leucocytes abound, with young epithelium cells, fat-granules, connective-tissue cells, and crystals of cholesterine; also a variety of micro-organisms—the diplococci and streptococci, rod-bacteria, the trichomonas vaginalis: sometimes gonococci, and the long bacilli of Döderlein, which last are said to prevent sepsis by developing an acid which destroys poisonous germs.

Treatment.—Antiseptic dressings are applied by the nurse for its reception as previously explained (page 220). The pads require to be changed, at first, six or eight times daily. After three or four days, three or four daily changes may be enough; all depends upon the amount of discharge, which varies in different cases. It is usually greater in those who menstruate freely, in those who do not nurse their children, and in multiparæ. The average quantity during the first eight days is three and a quarter pounds; of this total, nearly two and a quarter pounds are discharged during the first four days. Sometimes the discharge, after having lost its red color, will again become bloody. This is usually due to getting up too soon after delivery. In such cases put the patient to bed again, and if this alone do not restrain the flow, give ergot

three times a day; or tinct. fer. chlorid. gtt. xx, three times daily; or a *hot* water (110° F.) vaginal injection continued for fifteen minutes. The *most* important matter with regard to the lochia is the early recognition of any disagreeable, really *putrescent odor* it may possess. This calls for immediate investigation and thorough cleansing of the vagina and uterus by antiseptic irrigation (see Puerperal Septicæmia, Chapter XXXIV.). The *normal* odor of the lochia is, in a way, disagreeable, but it is *not* putrescent.

After-pains.—These are painful contractions of the uterus following delivery, for two or three—rarely four days. Often caused by retained blood-clots or membranes, owing to uterus having been imperfectly contracted after expulsion of placenta. Seldom occur in primiparæ. Are worse in short, inactive labors, and in cases where the uterus has been overdistended. The pains are intermittent, accompanied with hardening of the uterus, and are not attended with rise of pulse or temperature, by which they are distinguished from pelvic pain due to inflammation.

Treatment.—After-pains may be prevented by securing complete emptying and firm contraction and retraction of the uterus, during the third stage of labor. To relieve them, give two medicines, viz., *ergot*, to produce firm contraction of the womb and the expulsion of any blood-clots etc., it may contain; and an *anodyne* to lessen the pain of these contractions. Fld. extr. ergot ʒss, with tr. opii camph. ʒij, may be given every three hours, or ergot by the mouth and a rectal suppository of morphia. Chloral 10 grains; Dover's powder, 5 grains; phenacetin, 5 grains, or any other anodyne. Anodyne liniments and hot poultices of hops applied to the hypogastrium will sometimes afford relief. A laxative enema, the woman sitting up during its action (there being no contraindication to this proceeding, from previous hemorrhage or weakness), will often empty the uterus and secure its firm contraction, relieving after-pains. Digital removal of clots and pieces of membrane lodged in the os uteri may possibly be necessary, but this requires the strictest antiseptic *technique:* in most cases ergot and opium will be sufficient.

When the pains are due to neuralgia of the uterus, give quinia sulphat. gr. v–x.

They also occur from reflex irritation every time the child

is put to the breast. Time and patience will relieve this. To lessen suffering give potass. bromide, gr. xx; also anodyne liniments to breasts.

The Mother's Bowels.—Laxatives during the first two or three days after labor are not necessary, if the bowels were freely open before delivery. Otherwise an enema of castor oil with soap and water should be administered, or a dose of rhubard (pil. rhei comp. no. ij–iij). In case a more active purgative be needed, the much-commended "*post-partum pill*" of Dr. Fordyce Barker may be given, thus: ℞. Ext. colocynth. co., ℈j; ext. hyoscyam., gr. xv; pulv. aloes soc., gr. x; ext. nuc. vom., gr. v; podophyllin, ipecac, āā gr. j. M. Ft. pil. no. xii. S. Take two at once.

The Mother's Urine.—The urine may be wholly or partially retained from swelling of the urethra or want of contraction and loss of sensibility in the bladder. Relieve by the catheter three times a day until the parts resume their normal function. Ergot internally stimulates cystic contraction. Hot applications (sponges) to the pubes, or laving the vulva with warm water, may afford relief. The woman should be reminded, by the nurse, to pass water within eight hours after delivery, otherwise the bladder may become overdistended without the patient perceiving it. Change of posture from recumbency to sitting—there being no contraindication to it—may enable the woman to pass urine without a catheter.

When the instrument is used, it should have been previously submerged in an antiseptic solution, and the external genitalia should have been cleansed antiseptically to avoid the introduction of vaginal discharge into the bladder.

The Mother's Diet.—The "toast-and-tea" starvation system after delivery is injurious and obsolete. Give any easily digestible food — soft-boiled eggs, milk, meat-soups, bread, potatoes—but in moderate quantity, avoiding solid meats until after the milk secretion have become established. A purely liquid food is best for the first two days.

Milk Fever is a transient, slight, febrile excitement, preceded by chilliness, attending the establishment of the milk secretion. It scarcely requires treatment, and is far less fre-

quent and severe now than when the toast-and-tea diet system prevailed. Occasionally in debilitated women, a distinct rigor, high fever, and sweating occur; but once only—the patient is well next day. Recent authorities affirm that the milk fever is a myth. It has probably been abolished by proper feeding and antisepsis.

Sore Nipples.—"*Chapped Nipples.*"—The apex and sides of the nipples are affected with fissures like a chapped lip. There are great pain and some bleeding during suckling; pain on touching nipple; fissures visible on inspection; in severe cases, fever. The agony of suckling may lead to accumulation of milk, followed by inflammation and abscess of the breast.

Treatment.—Preventive: Caution the woman against flattening her nipples by pressure of corsets, etc. Keep them *antiseptically clean*, for at least a week before delivery, as well as after labor, between the acts of suckling, by frequent applications of a saturated solution of boric acid. The child must not sleep with the nipple in its mouth. After each act of nursing cleanse the nipple with warm water, dry it, and apply a light compress wet with boric acid solution.

Curative: While nursing use a nipple shield—one with hard base and rubber mouth-piece—previously rendered aseptic by immersion in boric acid solution. Each fissure may be touched twice daily with solution of argent. nitras, gr. xx, to water ℥j, by means of a *very fine* camel's-hair pencil. Wet the fissures *only*, not the whole nipple, with the silver solution. This treatment by the silver solution, if conjoined with *abstinence from suckling for twenty-four hours*, is most effective, and will sometimes cure in a single day.

Other applications are: Tannin and glycerin, equal parts; nitrate of lead, grs. x or xx, to vaseline, ℥j; the tr. benzoin co., applied with a brush, leaves a film over the erosion; lessens pain and promotes healing; bismuth subnitrate and castor oil equal parts applied frequently. Many other remedies have been employed. They must be removed, of course, before the child nurses. For slighter and more superficial irritations of the nipple without ulcers or fissures, cleanse and dry them after each act of suckling, and dust with powdered oxide of zinc or gum arabic. Another plan is to keep them moistened with a rag wet with Goulard's extract ℥ij, to water Oj, carefully washing it off before nursing the child.

Sunken Nipples.—The nipple is too flat, short, or sunken for the mouth of the child to grasp. The infant attempts to nurse, fails, and turns away crying. *Treatment:* Hold the child in readiness while the nipple is first drawn out by the mouth or fingers of an adult, or breast-pump, and then apply it promptly. Another plan: Hold over the nipple the mouth of an empty glass bottle whose contained air has been previously rarefied by heat, till the air cools, and the nipple is drawn up into the neck of the bottle. Then remove it and apply the child immediately.

Excessive Flow of Milk.—The breasts overflow, or become tender, hard, and distended from accumulation of milk. Danger of inflammation and abscess, if not relieved. *Treatment:* Restrict the woman's diet to dry food, as far as possible, abstinence from fluids. Laxatives, preferably salines, to produce watery stools and reduce the fluids of the blood. Diaphoretics (liq. ammon. acetat. ℥ss every two hours) to produce watery secretion from the skin. Locally: R. Ext. belladonnæ ʒj, liniment. camphor. ℥j. M. Sig. Apply to breasts with gentle friction of the hand. Instead of the belladonna, which is disagreeable and liable in some patients to produce dilatation of the pupil and other constitutional effects of the drug, rapid reabsorption of the milk may be secured by painting the breasts (all but the nipples) with tinct. iodini, and compressing them with cushions of raw cotton and a bandage.

Large doses of potass. iodid. (gr. xx three times a day) with rigid enforcement of dry, abstemious diet, and moderate, continued compression of the breasts with adhesive plasters, will soon *entirely stop* the secretion of milk, as may be necessary when the child dies or the mother is not able to nurse.

Deficient Milk-flow.—When due to anæmia, debility, or hemorrhage, build up the patient with iron, quinia, bitter tonics, and nutritious food, especially *milk;* but of all milk-producing foods the most directly efficacious is *crabs*, whether soft- or hard-shelled. Oysters, clams, lobsters, and nearly all kinds of shellfish are also good, care being taken to avoid any which, owing to idiosyncrasy on the part of the woman, disagree with her. A moderate amount of wine, or preferably malt liquor—lager beer—should be taken with meals. The reputed galactagogue property of fomentations to the breasts,

of leaves of the castor-oil plant, as well as that of the fluid extract taken internally, has been overrated. The application of electricity has been recently employed with some success as a galactagogue. One of the best *vegetable* foods is boiled fresh beets, eaten without vinegar.

Artificial Feeding.—If the mother cannot nurse her infant, it must be nourished by a wet-nurse. When none can be obtained, give cow's milk one part (by measure) to two parts of water and add milk sugar ʒiv to each pint of the mixture, the proportion of milk to be increased with age. When this food disagrees, and the child passes lumps of undigested curd, one-half of the water may be exchanged for lime-water. The water must be sterilized by boiling, and the milk, not by boiling, which impairs its nutritive value, but by *Pasteurization—i. e.*, by keeping it continuously for thirty minutes at a temperature of 167° F.

It is of the *utmost importance* that nipples, bottles, and vessels in which the food is prepared should be kept aseptically clean. They must *not be used twice* without being thoroughly cleansed—the bottles and vessels scalded and the nipples immersed in solution of boric acid. The best rule as to how much of the milk-mixture should be given the child *at one time*, is to give it as much as it will *readily take*.

How long should the Mother keep her Bed after Labor?—The popular, conventional rule is *nine days*. It is a custom without reason. Some strong, vigorous women, with healthy and well-contracted uteri, might get up sooner; others require a much longer period. Everything depends upon the character and complications of the labor, the strength of the woman, and the condition of the uterus. Too early getting up, while the womb is large and heavy, and its natural supports relaxed from the stretching of pregnancy and labor, endangers uterine displacements, congestion, return of bloody lochia, and subinvolution. It is better to err on the safe side, by making the lying-in too long, than to risk too early rising.

Suckling the Child.—The infant may be put to the breast as soon as it is washed, dressed, and ready for the mother, provided she be not over-tired. If she be, let her rest a few hours. The child may nurse about every four hours,

during the first day or two, before the flow of milk begins. After then, more frequently, every *two* hours, except from 11 P.M. to 5 A.M., when the mother should be allowed continuous sleep. When the child is six months old, five or six times in twenty-four hours will be sufficient.

The breasts should be suckled alternately—first one, then the other—and the nipples tenderly cleansed with a 4 per cent. solution of borax and water before and after each act of nursing.

The flow of milk is not usually established until the second or third day after delivery. During these first days there is, however, a little imperfectly formed yellowish milk, known as the "colostrum" (see page 70), which is enough for the infant without the addition of any artificial food, and acts upon it as a laxative to remove the "meconium," or native contents of the intestinal canal, consisting of unabsorbed bile, mucus, etc.

LAXATIVES FOR THE INFANT.—If the child's bowels fail to move spontaneously, which is rare, a little "pinch" of brown sugar dissolved in a teaspoonful of water may be given; or half a teaspoonful of olive oil, or a little enema of soap and water, or a small rectal suppository of glycerin. Before giving any laxative it must be known that the child is not suffering from imperforate anus. If the mother be constipated, laxatives given to her will reappear in the milk, and operate on the child.

The first evacuations from the infant are black in color, slightly tinged with green; they become yellow in a few days.

THE INFANT'S URINE.—If upon inquiry the child is reported not to have passed urine during the first day after delivery, examine the urethra and meatus for congenital deformity; feel, above the pubes, whether its bladder be distended, and ascertain that the urine has not been voided in the bath unawares.

If the bladder be full, a sprinkle of cold water on the hypogastrium, or a warm bath, may answer. A very small elastic catheter may, *very rarely*, be required.

Most cases of apparent retention of urine are really due to non-secretion; the infant takes but little food, and may excrete but little urine. Let it alone.

Infantile Jaundice (Icterus Neonatorum).—A common affection during the first week of infant life. *Symptoms:* Yellow skin and conjunctiva; high-colored urine; light-colored stools. *Causes:* Recently it has been ascribed to septic infection through the navel, especially in lying-in hospitals. The tight application of belly-bands, restricting the respiratory motions of the abdominal walls and diaphragm, upon which the portal circulation chiefly depends, is probably a factor in the production of the disease. It occurs more frequently in premature infants; in boys than girls; in the children of primiparæ, and in cases of malpresentation. *Treatment:* Nothing further than the removal of belly-bands may be necessary in slight cases. It soon goes away. In severe cases, with constipation, give calomel one-sixth of a grain, with one grain of white sugar, in powder, three times a day, for one or two days, followed by a teaspoonful of olive or castor oil.

In some cases there is *apparent* but no *real* jaundice. The skin is colored, while other symptoms are absent. It passes off without treatment.

Sore Navel.—An ulcer, usually with sprouting, flabby granulations, remains after falling off of stump of funis. Usually caused by friction and pressure of bandages too tightly applied; may also be due to septic infection. *Treatment.* Remove all dressings and bandages. Cleanse thoroughly with boric acid solution. Touch the granulations with pencil of argent. nit. Then dust navel with antiseptic powder of salicylic acid and starch (1 : 10) and cover with antiseptic cotton.

Umbilical Hernia.—In the common form of umbilical hernia in infants a soft protrusion, about the size of a finger-end, projects at the navel. It becomes more tense and prominent when the child cries. It is easily reduced by digital pressure, and the finger can then feel the sharp borders of the ring through which it came out. *Treatment:* A round disk of wood, a coin, or a button is wrapped in lint or some soft material, and kept in position over the umbilicus with a light elastic bandage or with strips of adhesive plaster, these appliances to be removed for cleansing purposes and replaced. Recovery occurs with subsequent closure of the ring.

A much more serious form of umbilical hernia *rarely* occurs,

with imperfect development of the abdominal wall, in which *large* protrusions of intestine and other abdominal organs take place. These require a plastic surgical operation.

Secondary Hemorrhage from the Umbilicus. — A dangerous and often fatal bleeding from the navel, coming on days, or even weeks, after delivery, and recurring (sometimes) again and again, in spite of styptics, ligatures, the actual cautery, and other means that must be promptly tried for its relief. The best plan is to transfix the base of the navel with two harelip pins, and pass a figure-of-8 ligature around the ends of each pin, so as to compress the bleeding vessels. Remove pins in five days, and leave ligatures to come away of themselves, with the ligated tissue, strict antisepsis to be observed both during the transfixion and subsequent dressings.

Inflamed Breasts of Infants.—In young infants of either sex, one or both of the breasts may become red, tender, and swollen. On pressure a few drops of milky fluid may be squeezed out, but this pressure should *never be allowed* or practised. Let the breasts entirely alone. The trouble will disappear of itself in four or five days. If attempts are foolishly made to press out the milk, pus may form, and a lancet be required to open the little abscess, always under antiseptic precautions.

Ophthalmia Neonatorum is an infectious purulent conjunctivitis, due to the gonococcus or some other pyogenic germ, and produced by contact with the eye of vaginal secretion from the mother during labor, or by infected fingers, instruments, cloths, etc. Statistics show that blindness in adults in about one-fourth of all cases is due to this disease.

Symptoms: Great swelling and sometimes bleeding of the eyelids; the ocular and palpebral conjunctivæ are red from *intense hyperæmia*, and the skin of the lids is often of a dusky red or bluish color; *profuse purulent discharge* of a gray, green, or yellow tint. The conjunctiva swells around the cornea, so that the latter appears sunk down in a circular depression. Bad cases go on to ulceration and sloughing of the cornea, with perforation into anterior chamber, if not properly and promptly treated. *Treatment:* Keep the eyes clean and free from accumulated pus by washing them every half-hour with

a saturated solution of boric acid, lids to be separated as widely as possible, and the solution dropped in plentifully; or the bulbous tip of a glass eye-dropper is placed alternately in the inner and outer angles of the lids and the solution slowly injected within them. In place of the boric acid some prefer a 1 : 5000 bichloride of mercury solution used in the same way. Besides this antiseptic cleansing, which must be faithfully done, both day and night (hence *two* nurses are required), drop into each eye, every night and every morning, two drops of a 2 per cent. solution of silver nitrate. After each washing place over the eye a light wet compress, kept cold by contact with ice. As the symptoms become less acute, use the silver solution *once* a day and reduce its strength to 1 per cent., the boric acid (or bichloride) solution to be continued until cure is complete. Inform relatives to beware of contagion. Isolate patient and burn all cloths, compresses, etc., once used. In labor cases, when infection is feared, use one drop of a 2 per cent. silver nitrate solution in each eye as a prophylactic measure.

CHAPTER XIV.

MECHANISM OF LABOR IN HEAD PRESENTATIONS.

By the mechanism of labor we understand the operation of the mechanical *forces*, and the execution of the mechanical *movements*, necessary to secure the passage of the child through and its exit from the pelvic (or rather parturient) canal.

In studying it there are *six presentations* to be considered, viz. :

1. Head presentations.
2. Face "
3. Breech "
4. Knee presentations.
5. Feet "
6. Transverse "

Posture or "Attitude"[1] of Child in Uterus.—The posture of the child *in utero* is very much that of an adult

[1] The technical term "*attitude*" therefore means the relation which the different parts of the child's body bear *to each other*—a meaning quite different from the terms "*presentation*" and "*position*," as will be seen immediately. Vide Appendix on Uniformity in Obstetrical Nomenclature.

FIG. 70.



L. O. A.

FIG. 71.



R. O. A.

FIG. 72.



R. O. P.

FIG. 73.



L. O. P.

FIG. 74.

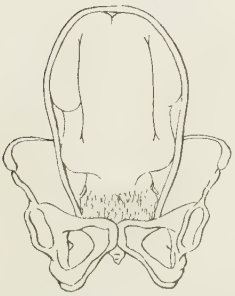


FIG. 75.



EXCEPTIONAL.

Figs. 70, 71, 72, 73, 74, and 75 represent the six positions of the occiput.

when trying to keep warm in a cold bed before going to sleep, viz.: the spine curved forward, the face bowed toward the chest, the thighs flexed upon the abdomen, the legs toward the thighs, and the arms flexed and folded across the breast. The child, *in utero*, thus flexed and folded, is more compact and occupies less space than it could do in any other posture; its whole frame approaches the *ovoid form* of the uterine cavity in which it reposes.

Now, when either *end* of this fœtal ovoid presents, other things being normal, delivery is mechanically possible. When it presents *crosswise*, delivery is impossible. Hence, presentations of the head, face, breech, knees, and feet may be considered *natural* presentations; while transverse presentations are *preternatural*. Sometimes head and face presentations are called "cephalic" presentations, because the cephalic (or brain) *end* of the ovoid presents; while breech, knee, and footling presentations are termed "pelvic" presentations, because the pelvic or caudal *end* of the ovoid comes first. The long spinal column *must* come one end first—either head or tail.

HEAD PRESENTATIONS.—Cases in which the head presents at the os uteri or pelvic brim.

THE FOUR "POSITIONS" OF HEAD PRESENTATIONS.—By the term "*position*" as appled in the mechanism of labor, we mean the *positional relation existing between a given point on the presenting part, and certain other given points upon the pelvis*. In head presentation the *occiput* is the given point on the presenting part, and the given points on the pelvis are the *two acetabula*, and *the two sacro-iliac synchondroses*. Thus the *four positions* of a head presentation are:

1. Occiput to *left* acetabulum (left occipito-anterior)[1] (occipito-læva-anterior).
2. Occiput to *right* acetabulum (right occipito-anterior) (occipito-dextra-anterior).
3. Occiput to *left* sacro-iliac synchondrosis (left occipito-posterior) (occipito-læva-posterior).
4. Occiput to *right* sacro-iliac synchondrosis (right occipito-posterior) (occipito-dextra-posterior).

[1] So called because the occiput is pointing to the *left* and *forward*. The same plan of nomenclature is applied to the other positions.

Very rarely the occiput points directly in front, to the symphysis pubis, or directly behind, to the sacral promontory, thus making *two* more positions (*six* in all). But these two may be left out. They usually become converted into one of the other four at the beginning of labor.

The order of greatest *frequency* of the four positions is as follows:

First. Occiput to *left* acetabulum, L. O. A.[1]

Second. Occiput to *right* sacro-iliac synchondrosis, R. O. P.

Third. Occiput to *right* acetabulum, R. O. A.

Fourth. Occiput to *left* sacro-iliac synchondrosis, L. O. P.

This order of frequency is worth remembering, but to *call* the positions first, second, third, and fourth is worse than useless, and had better be omitted.[2]

If the student be not already familiar with the terms and measurements given in describing the pelvis (Chapter I.) and fœtal head (Chapter II.), he should review them before attempting to learn the mechanism of labor. In the following description it is designed to give only the *main principles* of the mechanism, leaving exceptional occurrences and slight deviations and obliquities, of no great practical value, entirely out. A simple outline sketch had better be learned first. The finer shades of variation can be put in afterward. Mixture is confusion.

Stages of Mechanism in Head Presentations.—These are: 1. Flexion; 2. Descent; 3. Rotation; 4. Extension; 5. Restitution or external rotation.

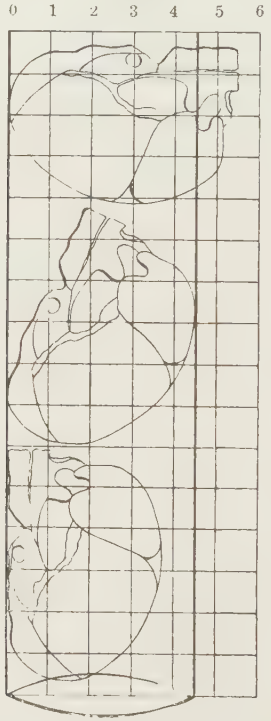
Mechanism in Left Occipito-anterior Position (Occiput to Left Acetabulum). 1. *Flexion.*—It must be remembered that the fœtal head is (roughly) egg shaped, and measures, from the *big* end of it to the *little* end (from the occiput to the chin), 5½ inches. While the occipital pole of the head is at the left acetabulum, the chin-pole must be somewhere toward the right sacro-iliac synchondrosis, and a line drawn between these two pelvic points is one of the oblique diameters of the brim, and measures 4½ inches. Is a head diameter of 5½ inches, then, trying to pass a pelvic diameter

[1] L. O. A., *Left Occipito-Anterior*; L. O. P., *Left Occipito-Posterior*.

[2] Naegele stated that in every 100 vertex presentations, 70 are L. O. A. positions, and 30 R. O. P., all others being extremely rare exceptions. Prof Cameron's figures are: L. O. A., 67; R. O. P., 20; R. O. A., 10; and L. O. P., 3 per cent.

of 4½? No; the bowed attitude of the child's head *in utero*, already mentioned, keeps its chin-pole tilted *up* toward the uterine cavity; and the occipital pole tilted *down* toward the os uteri and pelvis, so that the forehead instead of the chin is really at the right sacro-iliac synchondrosis, and it is, there-

FIG. 76.



Influence of flexion in permitting descent.

fore, the occipito-frontal diameter of the head (4½ inches in length) that is apparently trying to go through the oblique pelvic diameter of 4½. But this would be too tight a fit. The chin must be tilted yet more decidedly toward the sternum of the child, and the occiput be made to dip more decidedly

toward the entrance of the pelvis, in order that the oval-shaped head may enter the brim more or less endwise. This is *Flexion,* so called because the child's neck is *flexed*, and the chin pressed against the sternum. Fig. 76 shows, diagrammatically, the effect of flexion in permitting descent. In the upper head, unflexed, it is seen the 5½-inch occipito-mental diameter cannot enter the 4½-inch diameter of the brim (represented by the ring at the lower part of the figure). The middle head is flexed sufficiently to descend. The lower head shows an impossible degree of flexion—impossible when the head is attached to the neck—and undesirable, as it would permit the head almost to drop through the pelvis. The lines and numerals represent inches.

What *causes* flexion? The force of uterine contraction is transmitted through the body of the child to its head by means of the spinal column, but the cervical end of the spine, where it joins the cranium, is *not in the centre* of the base of the skull, midway between the two poles, but is *nearer the occipital pole;* this last, therefore, bears the brunt of uterine force and is made to dip down lower than the other pole. Moreover, the two poles meeting equal resistance from the circle of the os uteri and pelvic brim, the resisting force exerted upon the chin or frontal pole will be more effective because it is acting on the end of a longer lever than that applied to the occiput, hence the chin and forehead are tilted upward.

While the long (occipito-frontal) diameter of the head is more or less parallel with *one* oblique diameter of the pelvic brim, the transverse or biparietal diameter (3½ inches) occupies the *other* oblique (4½). Hence there is plenty of room for *that* to pass. The biparietal diameter is also *about* on a level with the *plane* of the superior strait, owing to the fundus uteri being so tilted forward as to bring the uterine axis in a line with the *axis* of the plane of the brim.

2. *Descent.*—The head having been tilted endwise by flexion, it enters, occiput first, the pelvic brim, and *descends* into the pelvic cavity. It goes on down (the occiput still toward the left acetabulum and forehead toward the right sacro-iliac synchondrosis) until reaching the pelvic floor (the bottom of the basin).

(*Note.*—While flexion and descent are thus described as separate processes, and while the former is necessary to the latter, it must not be supposed that flexion is complete before

descent begins; on the contrary, they go on simultaneously, each increment of flexion being accompanied with an increment of descent.)

3. *Rotation.*—The head having descended to the pelvic floor, its occipito-frontal diameter (4½) *now* occupies the oblique diameter of the *inferior* strait, which, however, measures *only four inches*. It cannot go on. Something must occur to bring the long diameter of the head parallel with the *antero-posterior* diameter of the outlet, which we know measures 4½ inches, or even 5 when the coccyx is pushed back. This is accomplished by rotation. Near the end of its "descent" the occiput strikes the pelvic floor and the slanting surface of bone in front of the ischial spine—the so-called left *anterior inclined plane*—

FIG. 77.



Occiput at inferior strait after rotation.

and gliding downward, forward, and inward toward the median line, it reaches the symphysis pubis, while the forehead, rotating downward, *backward*, and inward toward the median line (along the right *posterior* inclined plane), reaches the centre of the sacrum. Thus the ovoid head has come to occupy a position agreeing with the longest (antero-posterior) diameter of the outlet, and the occipital pole is almost ready to escape, endwise, through the inferior strait. (Fig. 77.)

4. *Extension.*—The head now stretches the perineum and soft parts into a kind of gutter, which constitutes the fleshy continuation of the parturient canal. The occiput descends below the symphysis pubis and passes on between the pubic rami, until the biparietal equator of the head fits into the pubic arch. The back of the child's neck meanwhile fits squarely against the posterior surface of the pubic symphysis,

and resting there immovably, the force of uterine contraction is expended upon the chin-pole of the head; hence, as soon as the resistance of the soft parts permits the occiput to begin to escape, the chin is released from its condition of flexion, and extension is said to have begun. Finally the forehead slips by the projecting coccyx, the parietal equator of the head emerges from the vaginal orifice, and the immediate retraction of the elastic perineum over, successively, forehead, nose, mouth, and chin, causes the occiput to rise up outside and in front of the pubes toward the mons veneris. Thus delivery takes place by the head describing a circular movement round the fixed centre of the pubic arch—a movement exactly the

FIG. 78.



Upward extension of occiput.

reverse of flexion, viz., *extension*. (See Fig. 78.) Remember the *direction* of extension in this L. O. A. position is such as to make the occipital pole go *upward* and *forward* toward the mons veneris. In the R. O. P. and L. O. P. positions we shall see this sometimes reversed.

It is worthy of remark and illustrates nature's adaptation of means to ends—in this case the adaptation of passenger to passage—that when anterior rotation of the occiput is complete and the head is about to escape by extension, *the projecting coccyx comes exactly in contact with the anterior fontanelle*, whose yielding surface offers less resistance than a hard bony one would do. (See Fig. 77, page 238).

5. *Restitution* (External Rotation).—The head, after being completely born by extension, hangs out of the vagina; the chin dropping toward the anus, the vaginal orifice encircles the neck. The head next twists, or rotates, in such a manner as to bring the occiput toward the mother's left thigh—the thigh corresponding to the acetabulum at which it originally presented. The purpose of this manœuvre is to facilitate delivery of the shoulders. Their longest diameter is, of course, the bisacromial—from one acromion process to the other. This diameter entered the brim and descended into the cavity of the pelvis, parallel with the oblique pelvic diameter extending

Fig. 79.



Restitution.

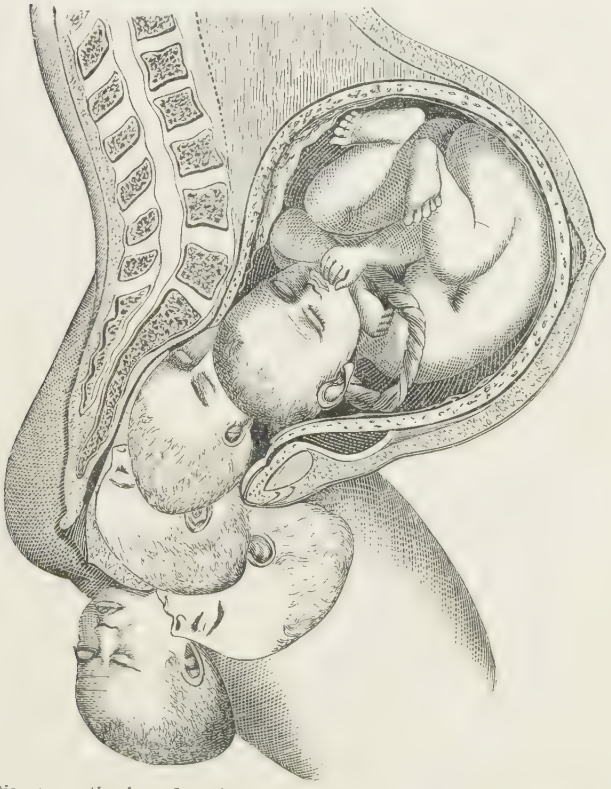
from the right acetabulum to the left sacro-iliac synchondrosis. But having reached the *inferior* strait, the bisacromial diameter must rotate from its oblique direction in the pelvis to the antero-posterior one. Hence the right shoulder glides along the right anterior inclined plane to the pubes; the left one along the left posterior inclined plane to the sacrum. This rotation of the shoulders *inside* the pelvis causes rotation of the head *outside* of it. The shoulder at the pubes usually fixes itself there, while the other one, at the perineum, swings round, describing a circular movement (as the occiput did), and comes out first. (See Fig. 79.)

When the shoulders are delivered the rest of the body usually slips out at once, without any special mechanism.

MECHANISM OF R. O. A. POSITION (OCCIPUT TO RIGHT ACETABULUM).

1. *Flexion*, by which the chin tilts up and the occiput down, so as to get the long diameter of the head more or less endwise to the pelvic brim.

FIG. 80.



Diagrammatic view of mechanism in a left-occipito-anterior *position* of a head *presentation*.

2. *Descent*, by which the head descends, occiput first, through the brim, into the cavity, down to the inclined planes of the pelvic floor.

3. *Rotation*, by which occiput glides along *right* anterior inclined plane, downward, forward, and inward to symphysis pubis; and forehead glides along *left* posterior inclined plane to middle of sacrum.

4. *Extension*, by which occiput escapes under pubic arch and rises up outside, toward mons veneris, while forehead, nose, mouth, and chin successively escape at perineum.

5. *Restitution* (external rotation), by which occiput turns toward mother's *right* thigh (the thigh corresponding to acetabulum at which it orginally presented), in consequence of shoulders rotating upon inclined planes—left shoulder to pubes, right to coccyx; the latter one generally escapes first. Delivery of the body.

Thus we have described the two *anterior* positions of the occ put: L. O. A. and R. O. A. Next come the two *posterior* ones.

Mechanism of R. O. P. Position (Occiput to Right Sacro-Iliac Synchondrosis).

1. *Flexion*, and 2, *Descent*, as in anterior positions of the occiput.

Fig. 81.



Extension after *posterior* rotation.

3. *Rotation.*—In the large majority of cases (96 per cent.), the occiput rotates all the way round to the symphysis pubis. In doing so it passes the right acetabulum, but it no sooner reaches this point than it becomes practically and in reality a right *anterior* position, and the rest of the mechanism is

precisely the same as already described for the R. O. A. position.

In the small minority of cases (4 per cent.) the occiput, instead of rotating forward, *rotates backward* to the sacrum, and the forehead comes to the pubes.

Then follows, 4. *Extension*, which takes place, not upward toward the mons veneris, but the occiput escapes over the perineum, and is depressed outside of it downward and backward toward the anus, while forehead, nose, mouth, and chin, successively emerge under the pubic arch. (See Fig. 81).

5. *Restitution.*—By internal rotation of the shoulders, as already explained, one goes to pubes, the other to sacrum, and the occiput rolls around to the right thigh (the thigh corresponding to the sacro-iliac synchondrosis at which it originally presented).

Mechanism of L. O. P. Position (Occiput to Left Sacro-iliac Synchondrosis):

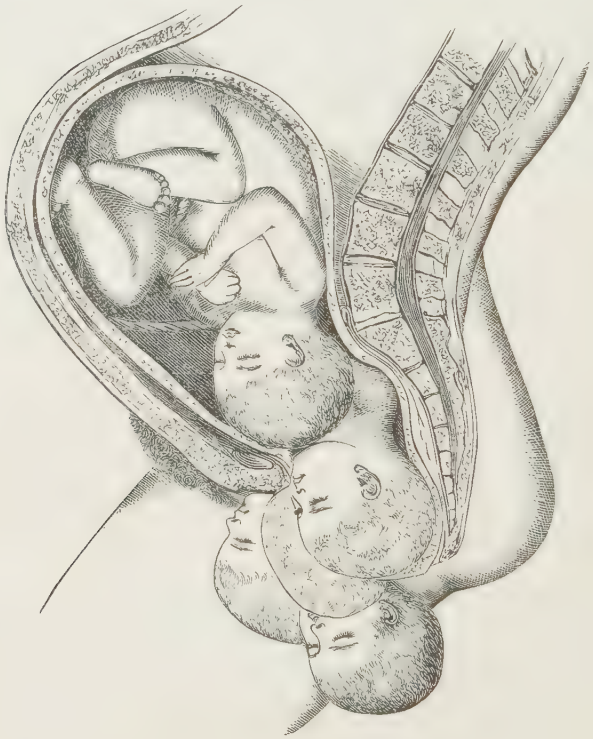
1. *Flexion.* 2. *Descent.* 3. *Rotation*, in the majority of cases all the way round to the symphysis pubis (when, on reaching left acetabulum, it, of course, becomes converted into a L. O. A. position); in the minority of case, backsward rotation of occiput to sacrum.

4. *Extension* of occiput downward and backward over perineum, while forehead, nose, and chin, successively escape under pubic arch. 5. *Restitution*, internally of shoulders, right one to pubes, left to coccyx: externally of occiput to left thigh (thigh corresponding to the sacro-iliac synchondrosis at which it originally presented).

Explanation of Posterior Rotation.—In those few cases of occipito-posterior positions where the occiput rotates to the sacrum, the circumstance is due to *imperfect flexion* of the head, so that the forehead is too low. In reality it is, therefore, anterior rotation of the forehead which causes posterior rotation of the occiput, in obedience to a general rule, that whichever pole of the head is the lowest in the pelvis will rotate to the pubic symphysis. Occasionally, however, the forehead, being lowest, will stick near the acetabulum, and then rise again, permitting the occiput to descend along the opposite sacro-iliac synchondrosis, when anterior rotation of the occiput, all the way round to the pubes, will take place just as the head is about to escape from the vulva.

Still another variation may occur when the occiput *has* rotated posteriorly, viz., instead of the occipital pole escaping over the margin of the perineum, the forehead, nose, and chin, successively, escape *first* under the pubic arch, when the chin

FIG. 82.



Diagrammatic view of mechanism in R. O. P. position, after *posterior* rotation of occiput.

rises up toward the mons veneris, and the occiput comes out *last* at the perineum. In fact the case is converted into a face presentation just before the head is born. This modification of the usual mechanism is exceptional.

Diagnosis of the "Position" in Head Presentations.—In the L. O. A. and L. O. P. positions, the part of the head first touched by the examining finger is the right parietal bone; in the R. O. A. and R. O. P. positions it is the left parietal bone. In either case it is that parietal bone which lies nearest the pubes. This is easily understood by remembering that the head enters the pelvis in a line with the long axis of the uterus, which agrees with the axis of the plane of the superior strait, while the finger enters the pelvis from below, and more in a line with the axis of the inferior strait, so that it necessarily touches the *side* of the presenting head. One parietal bone looks upward and backward, toward the sacral promontory, the other downward and forward toward the pubes. The latter one is touched first. Then by pushing the finger a little higher up and further backward toward the sacrum, the sagittal suture, running between the parietal bones, may be felt extending obliquely across the pelvis between the acetabulum and opposite sacro-iliac synchondrosis. If it be a L. O. A. position, the finger, by following the sagittal suture toward the left acetabulum, will there find the small triangular fontanelle at the junction of the sagittal and lambdoidal sutures. If it be a R. O. A. position, this fontanelle will be discovered by following the same suture toward the right acetabulum. If it be a R. O. P. position, following the sagittal suture toward the *left* acetabulum will *not* bring the finger to the *little* fontanelle, but to the large membranous anterior one. So in a L. O. P. position, the finger will find the large fontanelle at the *right* acetabulum, by following the sagittal suture in that direction. In the two posterior positions (last mentioned) the small triangular fontanelle cannot be touched at all—it is entirely out of reach.

In short, having felt the sagittal suture, follow it toward the acetabulum to which it points (it *must* point to one or the other), and there will be found the *posterior* fontanelle in *anterior* positions of the occiput (right or left, as the case may be); or the *anterior* fontanelle in *posterior* positions of the occiput (either right or left).

Later in the labor, when rotation has taken place, the posterior triangular fontanelle, in anterior positions, will be felt toward the symphysis pubis, the sagittal suture running backward toward the sacrum; while in those posterior positions where anterior rotation of the occiput does not take place, the

large, membranous, unmistakable anterior fontanelle will be felt toward the pubic symphysis.

The mode of making out the *position* in head presentations by *palpation*, viz., by recognizing the relative position of the child's *back, forehead*, and occiput, has been already explained. (See Chapter XII.)

Prognosis and Treatment of Occipito-anterior Positions.—Prognosis favorable in so far as the mechanism is concerned, and no assistance required in ordinary cases other than general attentions already mentioned under "The Management of Labor."

Prognosis and Treatment of Occipito-posterior Positions.—In the majority of cases the same as in anterior positions. In the minority of cases, where anterior rotation of the occiput fails to take place, a long and difficult labor may be anticipated, owing to the difficulty the occiput encounters in escaping over the perineum, on account of the posterior (sacral) wall of the pelvis being so much deeper than the anterior (pubic) one. Forceps may be required to complete delivery, the short straight ones being preferred. The perineum is enormously distended and requires additional care to prevent rupture.

Various expedients have been devised to promote anterior rotation of the occiput when it does not occur spontaneously. Thus, since we know posterior rotation is generally the result of *imperfect flexion* (the forehead being too low, the occiput too high), we may strive to remedy the difficulty by *making* flexion perfect. This can be done by pressing two fingers of one hand upon the forehead during the pains so as to push it up, or at least keep it from coming lower, while the force of uterine contraction is then expended in depressing the occiput. A vectis may at the same time be applied over the occiput to assist in pulling it down. The object is to get the occiput so low that it will pass *below* the spine of the ischium to the anterior inclined plane and rotate *forward*, while the forehead is kept high enough to pass *above* the opposite ischial spine and rotate backward. Rotation forward may sometimes be accomplished with forceps while making traction.

If the pelvis be large and the operator's hand small, the latter may be passed in alongside of the head, and the occiput

drawn obliquely downward and forward to the pubes. Another plan: Etherize to full anæsthesia. Pass a hand into vagina; grasp head, and steadily and gently push it up out of the pelvis, *above superior strait*. Then flex it, and rotate occiput forward. Hold it so until the pains, aided by pressure of other hand on abdomen, push it down again into pelvis, in its now occipito-anterior position. Forceps may be required to complete the delivery.

Posterior rotation of the occiput is especially likely to occur when the head is unusually *large*.

When, in occipito-posterior positions, the occiput *has* already performed *posterior rotation*—that is, when it has gone from the sacro-iliac synchondrosis to the hollow of the sacrum, no further attempts should be made to bring it forward; it must be delivered with the occiput behind, the straight forceps being used, in order to allow backward extension of the occiput down over the perineum.

Professor Penrose, however, advises that even after posterior rotation of the occiput has taken place a firm but prudent attempt should still be made with a short straight forceps to *force* rotation of the occiput to the pubis; and in case of failure thus to accomplish anterior rotation, or to deliver by traction while the occiput remain posterior, he urgently recommends an immediate resort to embryotomy, in the interest of the mother, even though the child be alive. (Hirst's *American System of Obstetrics*, vol. i. pp. 588, 589.) While it is true the prolonged labor and cranial compression jeopardize the child's life, the method of Dr. Penrose is, nevertheless, not generally concurred in.

Recently symphysiotomy has been successfully resorted to in cases where the child has not already been seriously injured by attempts to deliver in other ways.

Finally, it is especially in occipito-posterior cases that *time* and *patience* are required to allow *moulding* of the head, and *dilatation* of the soft parts; but assistance must be promptly rendered at the very beginning of symptoms indicating approaching exhaustion of either the woman or womb.

CHAPTER XV.

FACE PRESENTATIONS.

In face presentations the child's head, instead of being flexed, is extended, so that the *chin* end of the occipito-mental diameter is tilted down toward the entrance of the pelvis, while the occipital end is pressed up toward the child's *back*, just as the chin was pressed toward the child's sternum in head presentations.

Causes.—Any projection between chin and sternum interfering mechanically with flexion of the chin, such as congenital goitre or other tumors; hydrothorax; several coils of funis round the neck, etc.; any projection mechanically arresting descent of the occiput, and thus again obstructing flexion, such as ovarian, fibroid, or other tumors of the mother's parts; narrow pelvis; a very large or *long* fœtal head; *excessive lateral obliquity of the uterus.* This last is the most common cause. It produces extension, and consequently face presentation, in the following manner: Most cases of face presentation were at first head presentations. Now, if the occiput were toward the left acetabulum in an ordinary head presentation, and the fundus uteri were tilted much toward the right side, the direction of force of uterine contraction would be such as to press the occipital pole of the occipito-mental diameter upon the left edge of the pelvic brim, where it would remain solidly fixed, and the uterine force would then operate upon the other (chin) end, and force it down into the pelvic cavity, and a face presentation would result. Thus it is that posterior *positions* of face presentation are more frequent than anterior ones, they were changed *head* presentations, and the *position* in head cases is usually occipito-anterior; *when* changed, as just described, the chin is directed behind.

Very rarely the face presents originally, and is *not* a deviated head case; these are supposed to occur from the child having had convulsions in utero (opisthotonos).

Positions of Face Presentation.—The given point on the presenting part from which the positions of a face presentation are named, is the chin (Latin, "*mentum*").

FIG. 83.



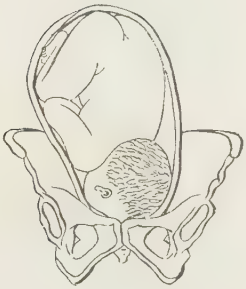
L. M. A.

FIG. 84.



R. M. A.

FIG. 85.



R. M. P.

FIG. 86.

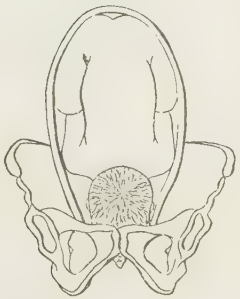


L. M. P.

FIG. 87.



FIG. 88.



EXCEPTIONAL.

Six positions of face presentations.

The *number* of positions, like those of the occiput, is four, as follows:

1. Chin to left acetabulum (left mento-anterior), L. M. A. (mento-læva-anterior).

FIG. 89.



Transverse position of face at superior strait.

2. Chin to right acetabulum (right mento-anterior), R. M. A. (mento-dextra-anterior).

3. Chin to right sacro-iliac synchondrosis (right mento-posterior), R. M. P. (mento-dextra-posterior).

4. Chin to left-sacro-iliac synchondrosis (left mento-posterior), L. M. P. (mento-læva-posterior).

The directly antero-posterior positions of face presentations, as seen in Figs. 87 and 88, are so extremely rare as to be almost never met with in practice. They are, however, possible, and when they occur, are spontaneously converted into one of the other four positions (represented by Figs. 83, 84, 85, and 86) during the progress of labor.

(*Note.*—The relative frequency of the several positions has not been positively ascertained, but the mento-posterior positions are more frequent than the mento-anterior ones. While the four *positions* of the face have been named according to the same plan adopted for the occiput, it may be stated that the chin is often *not exactly* at either acetabulum or sacro-iliac synchondrosis, but at some point between the two—*i. e.*, nearer the centre of the ilium, and hence the positions are called in some books simply right and left *mento-iliac*. (See Fig. 89.) The *chin*, however, will arrive at the acetabulum or sacro-iliac synchondrosis during the labor, and the plan we have adopted we think is best.)

Frequency of Face Presentations.—They occur once in about 250 labors.

Mechanism of Face Cases.—The whole matter is easily understood by remembering that the *chin* is the mechanical equivalent of the occiput, and follows the same mechanical movements as the occiput does in head presentations. The chin end of the egg-shaped head comes first. The several stages of the mechanism are: 1. Extension; 2. Descent; 3. Rotation; 4. Flexion; 5. Restitution (external rotation).

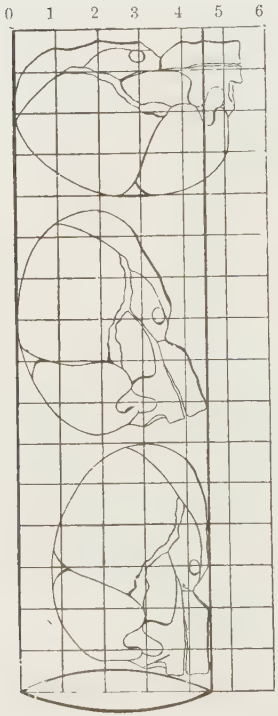
Mechanism of Left Mento-anterior Position (Chin to Left Acetabulum).—1. *Extension*, by which the occiput is tilted up and the chin down, so as to get the long (5½ inches) occipito-mental diameter more or less endwise to the plane of the pelvic brim. (See Fig. 90, page 252.) The diameter of the child's face that agrees with the oblique diameter of the pelvis in which it engages, is the fronto-mental—*i. e.*, the chin is toward the left acetabulum, the forehead toward the right sacro-iliac synchondrosis.

2. *Descent* (simultaneously, however, with extension), by

which the head *descends*, chin first, through the brim, into the cavity, down to the inclined plane and pelvic floor.

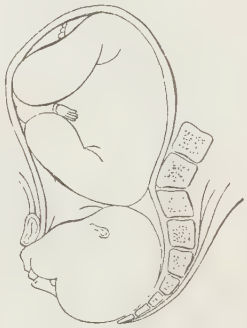
3. *Rotation*, by which the chin glides along the left anterior inclined plane, at once downward, forward, and inward toward

FIG. 90



Influence of extension in permitting descent.

FIG. 91.



Anterior rotation of chin.

FIG. 92.



Delivery by flexion of chin over pubes.

the median line, to the symphysis pubis; the forehead meanwhile glides along the right posterior inclined plane to the centre of the sacrum. (See Fig. 91.)

4. *Flexion*, by which the chin escapes under the pubic arch,

and rises up outside toward the mons veneris, while the forehead, parietal protuberances, and occiput successively emerge at the perineum (Fig. 92, page 252).

5. *Restitution*, by which the chin turns toward the mother's left thigh (the thigh corresponding to the acetabulum at which it originally presented), in consequence of shoulders rotating upon the inclined planes—left shoulder to pubes, right to coccyx.

Mechanism in Right Mento-anterior Position (Chin to Right Acetabulum).—1. *Extension;* 2. *Descent;* 3. *Rotation*—of chin, along right anterior inclined plane to symphysis pubis; of forehead along left posterior inclined plane to sacrum. 4. Flexion of chin upward, toward mons veneris, while occiput escapes at perineum. 5. Restitution, chin goes to right thigh (thigh corresponding to acetabulum at which it originally presented), by reason of shoulders rotating—right shoulder to pubes, left to sacrum.

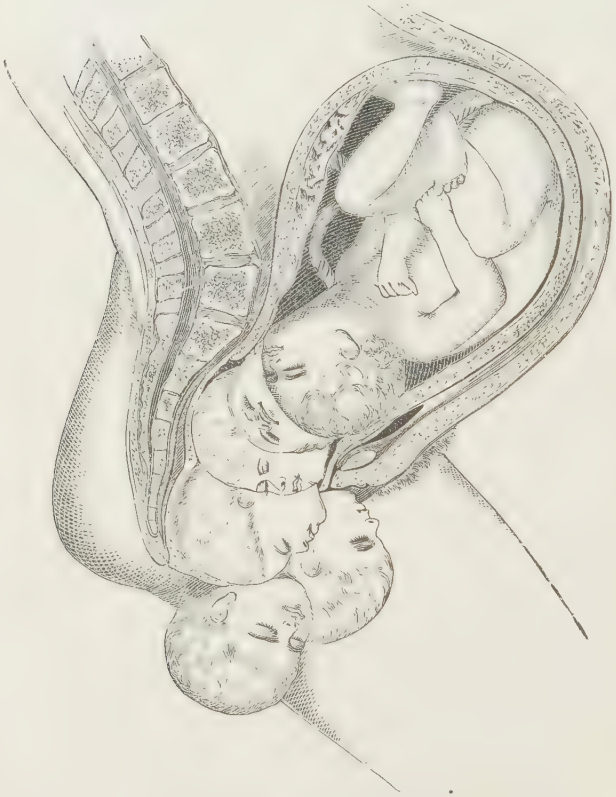
Mechanism in Mento-posterior Positions.—Before describing these, we may anticipate the same differences with regard to rotation and flexion as we found in head presentations with regard to rotation and extension; that is to say, in the great majority of cases, when the chin is directed posteriorly, it rotates all the way round to the symphysis pubis. In doing so, it, of course, passes the acetabulum, but it no sooner *reaches* the acetabulum than it is in reality an *anterior* position of the chin, and follows the same mechanism *exactly* as just described for mento-anterior positions. And, again, with regard to flexion when the chin is being born, it would, in mento-posterior positions, of course, be flexed *downward* over the perineum, instead of *upward* toward the mons veneris.

(*Note.*—It may here be anticipated, however, that such a mode of delivery in face presentations is practically a mechanical impossibility, as will be shown presently, and in which, therefore, the analogy between head and face presentations hitherto apparent, is wanting.)

Mechanism in Left Mento-posterior Position (Chin to Left Sacro-iliac Synchondrosis).—1. *Extension;* 2. *Descent;* 3. *Rotation*—in the *majority* of cases all the way round to the symphysis pubis (when the labor will be finished

as in mento-anterior positions); in the *minority* of cases, rotation of the chin backward to the sacrum, *when the mechanism stops, and completion of delivery is mechanically impossible,*

FIG. 93.



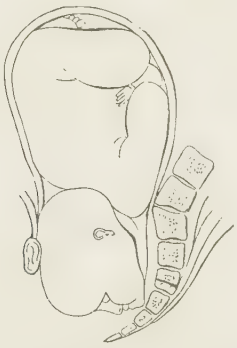
Diagrammatic view of mechanism in a right mento-posterior *position* of a face *presentation*, chin rotating to pubes.

unless, indeed, the head be unusually small and the pelvis unusually large, when delivery would take place by backward flexion of the chin down over the perineum. (See Fig. 94.)

Mechanism in Right Mento-posterior Position (Chin to Right Sacro-iliac Synchondrosis).—1. *Extension*; 2. *Descent*; 3. *Rotation*—in the majority of cases all the way round to the pubes (and delivery as for mento-anterior positions); in the minority of cases rotation of chin to sacrum, and consequent arrest of mechanism, further progress being impossible.

Explanation of Arrest, when Chin Rotates to Sacrum.—It is necessary for the chin end of the occipito-mental diameter *to escape over the edge of the perineum* before it can possibly execute the movement of downward flexion *outside* the perineum. Now, as we have seen, the depth of the *posterior* wall of the pelvis, from the sacral promontory to the tip of the coccyx, is four and a half inches, while *the length of the anterior surface of the child's neck, from the sternum to the chin, is only about one inch and a half* (only just long enough to span the depth of the *anterior* pelvic wall at the

Fig. 94.



Arrest of mechanism after posterior rotation of chin.

pubic symphysis); hence after posterior rotation of the chin the child's sternum impinges upon the pelvic brim at the sacral promontory, or perhaps begins to descend a little below it, and there stops, so that the chin is thus arrested in the pelvis while it is yet a good distance higher up than the point of the coccyx, and the chin-pole of the occipito-mental diameter *cannot escape* over the perineal border to perform flexion. (See Fig. 94.)

Diagnosis of Face Presentation.—The *side* of the face (at the begining of labor) is the part first touched by the examining finger—that is to say, in a L. M. A. position, the left malar bone; in a R. M. A. position, the right malar bone; in a L. M. P. position, the left malar bone; and in a R. M. P. position, the right malar bone. In passing the finger higher up, and more backward, the nose may be felt, the openings of the nostrils indicating the direction of the mouth and *chin;* while the orbits and forehead will be found in an opposite direction.

The face may be mistaken for a breech, owing to the swollen features resembling the genital organs. Diagnosticate by feeling the mouth, which is a fissure bounded by the *hard gums* of the maxillary bones, while the anus (to be felt in breech cases) is a soft elastic ring. No coccyx-point can be felt, as in breech cases.

Abdominal palpation in cases where vaginal examination is unsatisfactory, owing to the presenting part being high up and difficult to reach, may be useful and even necessary. The palpating fingers recognize the very round, large *prominence of the occiput on that side* of the pelvic brim (higher or lower according to degree of descent into excavation) toward which the *child's back* is directed; the head tumor appears *almost entirely absent* on the other side. In head presentation the *forehead*, directed toward the *child's abdomen*, was the most prominent and accessible region: difference very apparent. The breech is recognized by its usual characteristics in the fundus uteri, and while the palpating hand moves downward over the back toward the head, it *sinks into the deep depression or cavity* between the back and rounded pole of the extended occiput. The small irregular *projections of the extremities* over the *anterior* aspect of the child are more easily recognized than in head presentations, owing to the greater prominence of the abdomen caused by the child's body being bent *backward*, instead of being flexed forward as in head cases.

In some cases the horseshoe shape of the lower maxillary bone and chin may be felt on that side of the brim opposite the prominent occiput.

Diagnosis of the *positions* of a face presentation by palpation is made by noting whether the back and occiput are directed anteriorly or posteriorly, to the right or to the left.

Prognosis of Face Cases.—Swelling and discoloration of the child's face frequently occur (of which notice should be given before birth), but they pass away in a few days.

The child may die, if delivery be long delayed, from cerebral congestion due to pressure of its neck and jugular veins against the anterior pelvic wall; or its funis may be fatally compressed, after rupture of the bag of waters, between the *anterior projection* of the child's abdomen and the uterine wall.

Dangers to mother, such as may occur from any tedious labor, especially when, in mento-posterior positions, anterior rotation of chin fails to take place.

Though spontaneous delivery is the rule, the mortality to both mother and child is somewhat greater than in head presentations, and assistance is more frequently required.

Treatment of Face Cases.—In mento-*anterior* positions, generally none, further than carefully watching the case for symptoms of exhaustion from prolonged effort on the part of the mother, or of failure on the part of the child, when assistance may be rendered by forceps, provided the head have descended into the pelvic cavity. Use of forceps at the *superior strait* is not advisable in face cases; podalic version is preferable.

In all cases avoid rupturing membranes during examinations in early stage, and beware of injuring the eyes with the finger.

In mento-*posterior* positions, endeavor to secure anterior rotation of the chin when it fails to take place spontaneously. The several methods of attempting this are: 1. Press the forehead backward and upward during a pain, so as to make extension more complete, and thus cause the chin to dip lower down and touch the anterior inclined plane upon which it may glide forward. 2. Put a finger in the mouth, or on the outside of the lower jaw, and draw the chin forward during a pain. 3. Apply the straight forceps and twist the chin to the pubes. 4. Apply the vectis, or one blade of the forceps, *under* the most posterior cheek, and *over* the anterior inclined plane, thus, as it were, thickening the latter, so as to make it reach the malar bone and constitute a *point d'appui* which the chin can touch and so glide forward.

Should these attempts to secure anterior rotation fail, an effort may be made with the hand, vectis, or fillet, to bring down the occiput and convert the face into a head presentation.

In order to succeed in this manœuvre the membranes should be unbroken, the os uteri dilated, the face not so deeply engaged that it cannot be lifted to or above the pelvic brim, and an anæsthetic administered.

Again, failing in this way to produce anterior rotation, the head, if it be *not* too deeply engaged in the pelvis and have *not* passed through the os uteri, may be pushed back, and the child be delivered by *podalic version*.

Should none of these methods be practicable and the head become impacted in the pelvis with the chin toward the sacrum, the only resort is *craniotomy*. Attempts have been made in these cases to deliver by forceps after lateral incision of the perineum, but they can only succeed when either the child is small or the pelvis over-large. Usually the child's life has been so far imperilled by delay and its consequences that craniotomy may be done without compunction. Possibly symphyseotomy may prove useful in these cases in future.

In *all* cases of face presentation special care is necessary to avoid rupture of the perineum.

Correction of Face Presentation by External Manipulation.—*Early* rectification of face presentation—its conversion into an occipital one—by *external manipulation*, has been lately recommended. It is available only when membranes are unbroken, abdominal walls relaxed, and operator skilful. Let one hand, over the abdomen, seize the anterior shoulder, and lift it, with the chest, upward and toward the child's back, while the other hand, near the fundus, presses the breech upward and toward the child's abdomen. When the body is thus lifted the occiput will descend, or may be assisted so to do by the hand of an assistant pressed upon it, low down, after which the breech is pushed *directly downward* and flexion rendered perfect.

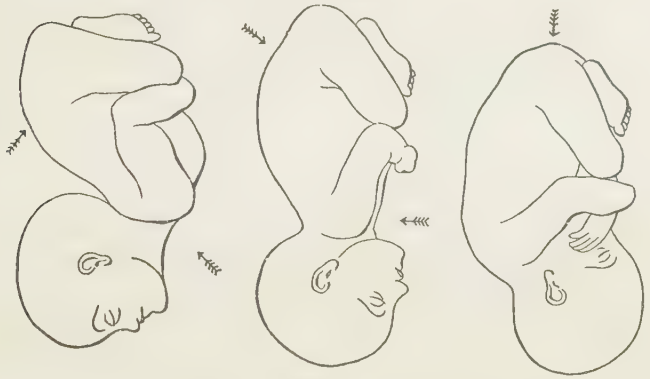
The annexed illustrations, modified from Lusk's reproduction of Schatz's diagrams (see Fig. 95), explain the method more exactly. The arrows indicate the direction in which pressure is applied to the several parts during successive steps of the operation.

Another plan: Let one hand press (externally, of course) upon the projecting sternum of the child, pushing it toward the child's spine, and somewhat upward toward the fundus uteri, while the other hand (externally) presses the occiput in

the other direction, viz., downward and forward toward the anterior surface of the child's body, thus bringing the chin to the chest, which is flexion, and presentation of the occiput results.

Again: these manipulations can be carried on by *one* operator *externally*, while the fingers or hand of *another* assist in flexing the head by manipulating, *per vaginam*, internally.

FIG. 95.



Schatz's method of rectification by external manipulation.

Finally, let the young practitioner especially remember that the great majority of face cases will be delivered without assistance or interference, provided all other conditions are normal.

BROW PRESENTATIONS. — A rare presentation (of the "brow" or forehead) intermediate between a head and a face. It occurs in this way: face presentations are deviations from head presentations—that is, in face presentations the head originally presented, but the occiput catching on the side of the brim, lodged there, while the chin was forced down, constituting face presentation; but in this process of conversion of a head into a face, arrest may take place half-way between the two, when, of course, the forehead will be made to appear and stop at the centre of the superior strait: this is a brow presentation. The *diagnosis* may be made out by the position of the large anterior fontanelle and its radiating

sutures, the prominence of the forehead, the orbits, and parietal bones. *Treatment* consists in converting the "brow" into either a head or face presentation, by producing, respectively, complete flexion or complete extension, preferably the former, by pushing up the forehead, and bringing down the occiput. In many cases it takes place spontaneously.

Manipulations for this purpose may be either external or internal or both conjointly, as just stated for face presentations. Two fingers may be introduced into the child's mouth and traction made on the *superior* maxilla to produce extension and convert the brow into a face presentation.

Podalic version has been recommended when the diagnosis is made early; it should be limited to cases with a contracted conjugate diameter, or where speedy delivery is required to save mother or child.

When the brow presentation has been changed, by manipulation, into a head or face, but reverts to its old position, forceps may be employed to prevent this reversion, as well as to hasten delivery by traction.

In mento-posterior *positions* of a brow presentation the same difficulties may occur, when the case is changed into a face, as in face presentation, hence every effort must be made to rotate the chin to the pubes.

When all other measures fail craniotomy may become a last resort, and should certainly be an *early* one when the child is *dead*, for the mother's sake.

As in face cases, it is possible the future may demonstrate the utility of symphyseotomy in difficult brow presentations.

CHAPTER XVI.

BREECH, KNEE, AND FOOT PRESENTATIONS.

Breech Presentations.—These occur once in about fifty labors (2 per cent.). The pelvic end of the fœtal ovoid presents, the lower limbs being flexed upon the abdomen, so that the buttocks first enter the pelvic brim. Usually the legs are flexed upon the thighs, as shown in Figs. 96 to 101; exceptionally they are extended at full length, so that the feet

approach the face or point over the shoulders. (See Fig. 102, p. 263, and Fig. 103, p. 264.)

Positions of a Breech Presentation.—Of these there are *four;* and the given point on the breech, from which they are named, is the child's *sacrum.* Exceptionally the child's sacrum may be directly in front or behind, really making six positions. Thus:

Fig. 96.



R. S. A.

Fig. 97.



L. S. A.

Fig. 98.



L. S. P.

Fig. 99.



R. S. P.

1. Sacrum to left acetabulum (left sacro-anterior), L. S. A.—sacro-læva-anterior.

2. Sacrum to right acetabulum (right sacro-anterior), R. S. A.—sacro-dextra-anterior.

3. Sacrum to left sacro-iliac synchondrosis (left sacro-posterior), L. S. P.—sacro-læva-posterior.

Fig. 100.

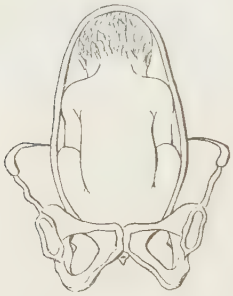


Fig. 101.



Exceptional.

Figs. 96, 97, 98, 99, 100, 101. Six positions of breech presentation.

4. Sacrum to right sacro-iliac synchondrosis (right sacro-posterior), R. S. P.—sacro-dextra-posterior.

The two *sacro-anterior* positions are most frequent.

Mechanism of Breech Cases.—In complete delivery of the child there are here three successive stages to be considered, viz.:

1. Mechanism of the breech.
2. Mechanism of the shoulders.
3. Mechanism of the head.

Each of these may again be subdivided as follows:

a. Moulding,
b. Descent,
c. Rotation, and
d. Delivery *of the breech.*
e. Descent,
f. Rotation, and
g. Delivery *of the shoulders.*
h. Flexion,
i. Descent,
j. Rotation, and
k. Delivery *of the head.*

Mechanism in Left Sacro-anterior Position (Sacrum to Left Acetabulum).—Here the longest diameter of the breech, viz., from one trochanter to the other, occupies that

oblique diameter of the brim which extends from the *right* acetabulum to the *left* sacro-iliac synchondrosis. The sacrum of the child being directed toward the left acetabulum, its back, and, of course, the back of its head (occiput) are directed

FIG. 102.



Breech presentation—legs extended.

toward the left anterior part of the uterus, in a line with the left acetabulum; hence, when the body is delivered the *occiput of the after-coming head will also be directed to the left acetabulum.* As labor progresses there occur:

1. *Moulding* of the breech, by which it simply becomes gradually compressed ("moulded") into a circular shape, so that it may pass through the os uteri and pelvic brim.

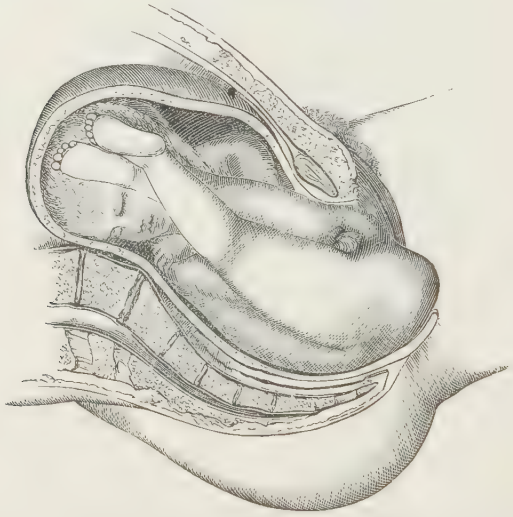
2. *Descent.*—The breech passing down the pelvic cavity to the pelvic floor.

3. *Rotation.*—The left hip (the hip nearest the pubes) glides along the right anterior inclined plane to the pubic symphysis; while the right hip (the hip nearest the sacrum) glides along the left posterior inclined plane to the sacrum. The long (bi-trochanteric) diameter of the breech, which entered the

brim in the oblique pelvic diameter, has now, therefore, become parallel with the longest (antero-posterior) diameter of the inferior strait. (See Fig. 103.)

4. *Delivery* of the breech—the hip that is toward the pubes fixing itself against the arch, while the other one sweeps round the curve of the (maternal) sacrum and comes out first at the perineum.

FIG. 103.



Rotation and delivery of hips. This figure represents the legs *extended*, which is unusual.

(*Note.*—It should again be observed that *descent* necessarily occurs *simultaneously* with and during all the other stages. So the shoulders and head have, of course, been simultaneously descending with the breech. Descent is considered as a separate stage only in so far as it is a necessary preliminary of rotation—*i. e*, the descending part *must come down* low enough to strike the *inclined planes* and pelvic floor before rotation can occur.

Note further, that when the breech is extruded the child's body has necessarily become bent *on its side* conformably to the curve of the pelvic canal. Sometimes this is improperly

set down as a separate stage of mechanism, called "lateral flexion.")

To resume, the breech having been delivered, we have next to deal with the shoulders, thus:

5. *Descent.*—The longest (bisacromial) diameter, entering the brim at the same oblique diameter as the bi-trochanteric diameter of the breech did, descends to the pelvic floor.

6. *Rotation.*—The shoulder nearest the pubes (left one) rotates to the pubes: the shoulder nearest the sacrum (right one) rotates to the sacrum (see Fig. 104), which brings the bisacromial diameter antero-posterior at the inferior strait

FIG. 104.



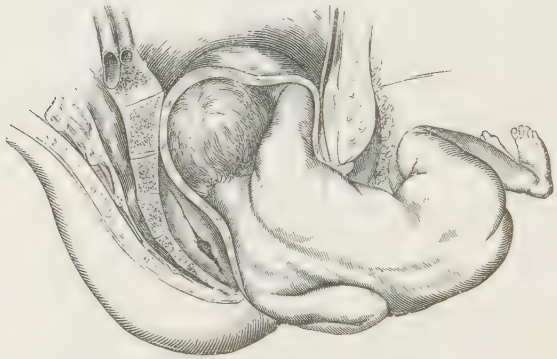
Rotation of shoulders: their long (bisacromial) diameter in line with long (antero-posterior) diameter of outlet.

7. *Delivery of the shoulders*—the one toward the pubes fixing itself there, while the other one sweeps round the curve of the sacrum, and comes out first at the perineum. (See Fig. 105.)

The shoulders having been delivered, next comes the head, thus:

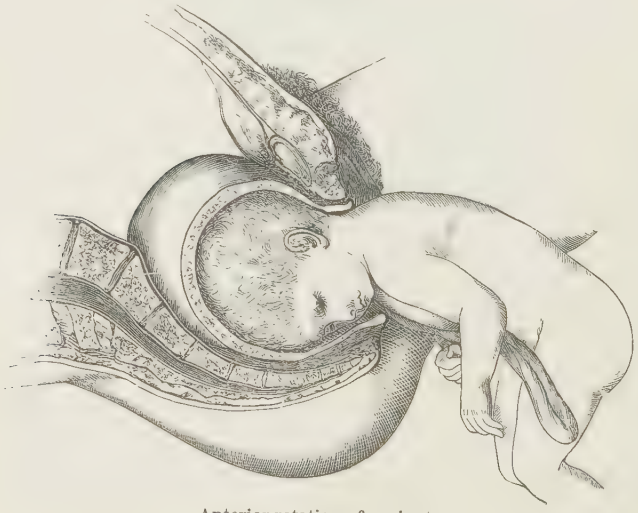
8. *Flexion*, by which the chin-pole of the occipito-mental diameter is made to dip down toward the child's sternum,

FIG. 105.



Delivery of lower shoulder first, at the perineum. (In Fig. 104 occiput is to the left; *right* shoulder will come first at perineum. In Fig. 105 occiput is to the right, and *left* shoulder comes out first at perineum.)

FIG. 106.



Anterior rotation of occiput.

while the occipital pole is tilted up toward the fundus uteri, thus placing the occipito-mental diameter more or less endwise and parallel with the axis of the pelvis. The occiput is toward the left acetabulum and the forehead toward the right sacro-iliac synchondrosis; hence the occipito-frontal diameter occupies an oblique diameter at the brim.

9. *Descent* of the head into the pelvic cavity, until occiput strikes left anterior inclined plane.

10. *Rotation*—of occiput to pubes—of forehead and face to hollow of sacrum, thus bringing longest engaging diameter of head antero-posterior at the outlet. (See Fig. 106, page 266.)

11. *Delivery of Head*—the occiput fixing itself *behind* the pubic *symphysis*, the back of the child's neck *under* the pubic *arch*, while the chin escapes first at perineum, followed successively by mouth, nose, forehead, biparietal equator, and last of all the occiput itself, which sweeps along the curve of sacrum.

Mechanism in Right Sacro-anterior Position (Sacrum to Right Acetabulum).—*Moulding*, *descent*, and *rotation* of the breech. The hip nearest the pubes rotating to the pubes, the one nearest the sacrum to the sacrum. *Delivery* of the breech – the hip nearest the sacrum coming out first at the perineum.

Descent and *rotation* of the shoulders—the shoulder nearest the pubes rotating to the pubes, the one nearest the sacrum to the sacrum. *Delivery* of the shoulders—the one at the sacrum coming out first over the perineum.

Flexion, *descent*, and *rotation* of the head—the occiput (now at the right acetabulum) rotating on the right anterior inclined plane to the pubes, the forehead to the sacrum. *Delivery of the head*—chin, mouth, nose, forehead, biparietal equator, and lastly occiput, successively escaping over perineum.

Mechanism in Left Sacro-posterior Position (Sacrum to Left Sacro-iliac Synchondrosis).—Moulding, descent, rotation, and delivery of the breech; and descent, rotation, and delivery of the shoulders exactly as already described for *anterior* positions of the sacrum.

Flexion and descent of the head are also the same, *except*

that the occiput enters the pelvis directed toward the left sacro-iliac synchondrosis instead of toward one of the acetabula.

Hence *rotation* of the occiput takes place, *in the majority of cases*, all the way round to the symphysis pubis, when the rest of the mechanism is the same as just described for *anterior* positions of the occiput. *In the minority of cases* the occiput rotates posteriorly into the hollow of the sacrum, the forehead to the pubes.

Delivery of the head now takes place (most often) by *continued flexion*, the chin-pole of the occipito-mental diameter

FIG. 107.



Posterior rotation of occiput and delivery by flexion.

dips toward the child's sternum (*under* the pubic arch), while the occiput is tilted up posteriorly toward the sacral promontory. The nape of the child's neck rests on the perineum, while chin, mouth, nose, forehead, biparietal equator, and lastly occiput, successively escape *under* the pubic arch. (See Fig. 107.) The figure in *solid* lines shows the direction in which the body must be held.

Delivery of the head may also take place (but more rarely) by *continued extension*. Thus, the chin-pole of the occipito-mental diameter, instead of being depressed *under* the pubic arch, points up *above* the pubic symphysis—in fact, toward the woman's bladder. The *anterior* surface of the child's

neck is fixed against the *posterior* aspect of the symphysis pubis, while the occipital pole of the occipito-mental diameter is forced down along the hollow of the sacrum to the coccyx, and escapes first at the perineum, followed successively by bi-

FIG. 108.



Posterior rotation of occiput and delivery by extension.

parietal equator, forehead, nose, mouth, and, last of all, the chin itself. (See Fig. 108.) The body to be held up toward the pubes.

MECHANISM IN RIGHT SACRO-POSTERIOR POSITION (SACRUM TO RIGHT SACRO-ILIAC SYNCHONDROSIS).—The first parts of the labor are the same as just described for the *left* sacro-posterior position. When the breech and shoulders are delivered, the occiput is, of course, directed to the right sacro-iliac synchrondrosis. In the majority of cases it rotates all the way round to the pubes, and so becomes an anterior position. In the minority of cases it rotates to the sacrum, and will then be delivered either by *continued flexion*, the *chin* escaping first under the pubic arch, or by *continued extension*, the *occiput* escaping first at the perineum, as just described for the L. S. P. position. Cases in which posterior rotation of the after-coming head occurs comprise a very *small*

minority; such rotation is extremely rare, and will seldom be seen in ordinary practice.

(*Note.*—Sometimes in sacro *posterior* positions of the breech, the rotation which brings the anterior hip to the pubes *goes on further*, so as to bring the child's *back* to the pubes, or the back comes to the pubes by continuation of the shoulder rotation. In this way the occiput is brought in front to the acetabulum before its descent to the pelvic floor. It has become occipito-anterior.)

Mechanism of Knee and Footling Cases.—These do not require separate study. The feet and knees are small enough to pass through the pelvis without any special mechanism. The breech and other parts following them undergo the same movements as in original breech cases.

Diagnosis of the Breech.—The examining finger *first* touches the *side* of the anterior buttock (the one directed toward the pubes), and feels the trochanter covered by muscles, etc., which make it softer than the hard globe of a head presentation. The fissure between the nates, the genital organs, the anus, the probable presence of meconium (thick and undiluted with liquor amnii), the tip of the coccyx, and spinous process of sacrum, are sufficiently characteristic. Scrotum in males sometimes swollen and œdematous, resembling polypus or tumor, but is less solid. Difficulty in early stage, owing to height of presenting part. Bag of waters may be large or protrude as elongated sac. Beware of mistaking fœtal vulva for axilla, and fat fold of elbow for fissure of nates. Elbow has three bony projections (olecranon and two humeral condyles). Diagnosis from face (see face cases, p. 256). Diagnosis of the "*position*" of a breech "*presentation*" may be determined by the direction of the fissure between the nates and by the tip of the coccyx, which always points forward toward the pubes of the child.

When the presenting part is too high up to be touched satisfactorily *per vaginam*—as will often happen early in labor, or before its beginning—diagnosis may be made by abdominal *palpation*. Early in labor the breech will be at or above the pelvic brim; it *never descends at this time*, as the head sometimes does; hence palpating finger-ends, entering the brim behind pubic rami, find *excavation empty*. Tumor

of breech (not often central, but usually more toward one or other iliac fossa) feels *softer*, *more irregular*, and *more voluminous* than globe of head. Resisting plane of back is *continuous* with breech from below, while above the fingers sink into elastic depression between trunk and head. Head discovered in fundus uteri usually more on that side opposite to the iliac fossa toward which the breech lies. Head may be concealed under liver, or behind false ribs, and hence difficult to palpate, especially in primiparæ, in whom the child is apt to lie more vertically (less oblique) than in multiparæ. Head may be *made* more *palpable* by pressing breech more toward the iliac fossa, which brings the head more within reach on the opposite side of the fundus. In following resisting plane of back it will be found to curve over above the umbilicus toward the side where the head lies. The latter may sometimes be made to move by *ballotting*. In sacro-*posterior* positions the breech tumor will *nearly always* be accompanied by the movable *small parts*. In sacro-*anterior* positions the breech will *rarely* be accompanied with small parts. The small parts and intervening elastic spaces filled with liquor amnii will usually be found on the side of the uterus opposite the child's back. In sacro-*posterior* positions the *lateral* aspect of the child's trunk will be more easily recognized than the back itself. (See Figs. 96, 97, 98, and 99, in which, however, the child's body should have been placed *more obliquely* —the breech more over the iliac fossa, the head further toward the opposite side.)

Diagnosis of Knee.—Chiefly by exclusion. By its large size; by the tibial spine and patella. From a shoulder by the absence of ribs and intercostal spaces, etc. From an elbow, by the *flat* patella—very different from the *pointed* olecranon.

Diagnosis of Foot.—By the projecting heel. From a hand by the fingers being longer than the toes. The great toe is longer than the others—the thumb shorter than the fingers. The fingers can be easily separated; the toes cannot. The foot is placed at right angles to the leg; the hand is in a line with the arm. The foot is thicker and not so flat as the hand. Its inner border thicker than its outer one—not so the hand. When, before rupture of the membranes, the foot is touched by the obstetrician's finger, it will usually be drawn

up with a quick jerking movement, while the hand, under like circumstances, will move away slowly, if at all, or grasp the examining finger.

Prognosis of Breech Cases.—Generally favorable to mother, though labor may be long; but dangerous to child. When body is delivered and head retained, child dies from *suffocation* due to pressure on umbilical cord or to partial separation or compression of placenta. Danger greater in footling than breech case, because small feet do not dilate os uteri sufficiently to permit easy passage of after-coming head, hence delay is longer after expulsion of body than occurs in breech cases. Liability to prolapse of funis. In cases where legs are extended along front of child, labor may be long and difficult. The limbs act like splints, preventing that *lateral* flexion of the body by which the latter is conformed to the curve of the axis of the pelvic canal. In difficult cases, child liable to injury from manipulations during delivery, hence fracture or dislocation of humerus and femur; injury to spinal column or spinal cord by traction on trunk; temporary paralysis from pressure on brachial plexus; hemorrhage into muscles and cellular tissue of neck, especially hæmatoma of sterno-mastoid muscle.

Treatment of Breech Cases.—Do nothing until the birth of the breech.[1] Preserve membranes from rupture. Refrain from attempting to hasten matters by drawing down the feet. It produces displacement of the arms above the head, and also extension of the occiput. Delay during early stages of labor is *not dangerous*, but prepares the parts, by prolonged dilatation, for subsequent easy passage of after-coming head. Delay of latter *is fatal* to child.

When the breech is born, promote lateral flexion of body by pressure on perineum. When trunk is delivered, receive, support, and wrap it in warm cloth. Gently pull down a loop of the cord, and place it toward that part of the pelvis where it will be less liable to pressure, viz.: toward that sacro-iliac synchondrosis to which the child's abdomen is directed; but waste no time in doing this. Feel pulsations in cord;

[1] It has been recently recommended to perform cephalic version by external manipulation, early, before rupture of membranes, to avert subsequent danger to child.

their feebleness proclaims danger to child. Hold the body in such a manner as not to impede rotation of shoulders into antero-posterior diameter of outlet. When shoulders are born, direct back of child to pubic symphysis, thus promoting anterior rotation of occiput. During birth of head lift body toward mons veneris.[1]

In the *rare* cases where *rapid spontaneous* delivery of the head follows extrusion of trunk no further active interference is necessary.

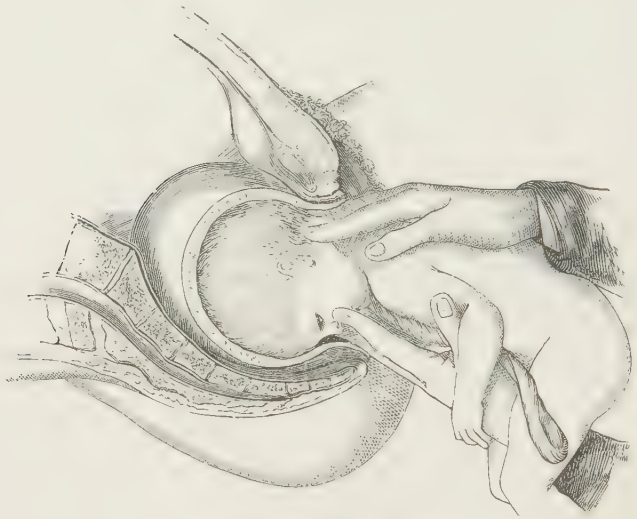
But *rapid spontaneous* delivery of after-coming head is exceptional. Delay is fatal; judicious assistance harmless. If the shoulders be not readily extruded, first one (that at perineum) and then the other must be drawn out by the finger hooked over the elbow or acromion process of the shoulder, *elevating* the breech while withdrawing the *posterior* shoulder —*depressing* it toward the perineum while getting out the *pubic* one. For various methods of delivering the arms in different cases, see Chapter XVIII., on "*Version.*"

The means for rapid delivery of head when it has *descended to the inferior strait*, and occiput has rotated to the pubes, are: Ergot (hypodermically if the case be urgent); manual pressure of fundus uteri through the abdomen by a skilled assistant previously secured; urging the woman to bear down during the pains with all the voluntary effort she can command; and traction judiciously applied thus: support body in left hand, one or two fingers of which may be passed in along posterior vaginal wall to child's mouth (or to upper jaw-bone, one finger being on each side of the nose), and its chin depressed toward its chest, while two fingers of the right hand are passed in under pubic arch and pressed upon the occiput so as to tilt it up and *assist flexion*. (See Fig. 109, p. 274.) Thus, during traction, the chin-pole of occipito-mental diameter is made to escape over perineum, and delivery follows. The finger (or two of them) of left hand may also be passed into rectum and made to press through the recto-vaginal wall upon the forehead, thus again promoting *flexion*.

[1] An ignorant savage woman of the woods, finding the body of her child extruded, would (it may be presumed), in a mingled spirit of affection and investigation, *lift the body upward, over her own abdomen*, thus causing *pressure on the fundus* uteri, and *making traction* in a way to promote delivery of the head. Hence it is interesting to observe that the methods of science have unconsciously followed the teaching of Nature's school to the untutored savage—a seal of sanction not to be disdained.

Another method. Seize the feet with the right hand, and hook the left hand over the back of the neck (Fig. 110). Traction on the legs is now made in a direction *almost at right angles to the pubes*, so that the resistance of pubic bones, impinging against occiput, pushes it up, while chin and face flex and descend along sacrum, escaping at perineum. The left hand steadies the head, prevents its too sudden escape,

FIG. 109.



Extraction of head in breech cases.

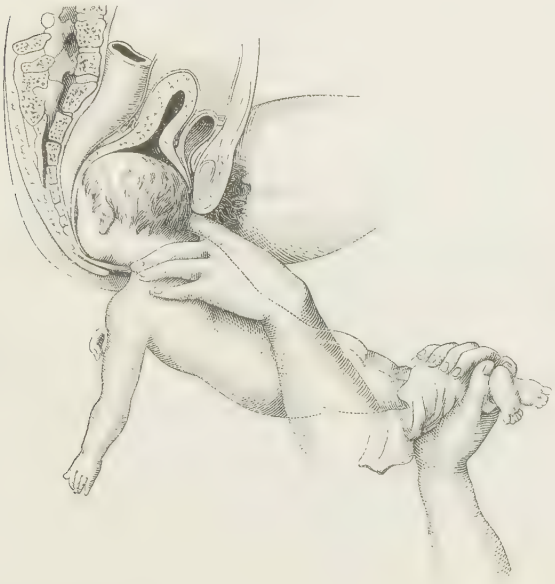
and also assists the right in making traction. The hand of an assistant, pressing upon fundus uteri, will expedite the process, as in the first method described.

In cases of sacro-*posterior* positions where anterior rotation of occiput has failed to occur, depress the body toward perineum, pass one or two fingers under pubes to that temple or side of the face directed anteriorly, and press it round toward the sacrum. Face cannot be forced round to sacrum by *twisting body* without danger to child's neck.

Should this proceeding fail, and the occiput *still remain posterior*, the head must be delivered in one of two ways,

viz.: If the head be *flexed* with the chin *below* the pubic arch, traction must be made directly *downward;* that is to say, the woman being upon her back, with her hips over the edge of the bed, make traction on the body vertically *down* toward the floor; aid this by suprapubic external pressure,

FIG. 110.



Manual extraction of after-coming head. (From GALABIN.)

and one or two fingers may be passed into rectum, pushing *up* the occipital pole, while external hand presses *down* the forehead, thus securing *complete flexion*—the proper mechanism for delivery.

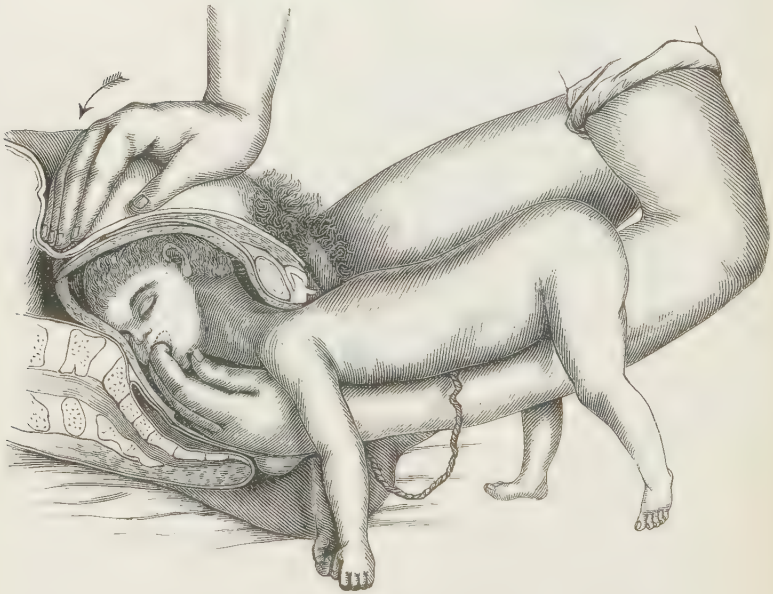
The other way is by *extension*. Now the chin is *above* instead of below pubes. Traction on body must be made vertically *upward*—toward the ceiling instead of the floor—while the hand on abdomen makes pressure downward and backward upon the chin. One or two fingers passed far into

the rectum may assist extension and extraction by pressing occiput forward toward pubes.

When manual delivery fails, forceps may be applied to the after-coming head. (See Chapter XIX.)

Extraction when after-coming head is at superior strait.—Pressure on the fundus uteri from above, and traction on the feet and shoulders in line with *axis of plane of superior strait*,

FIG. 111.

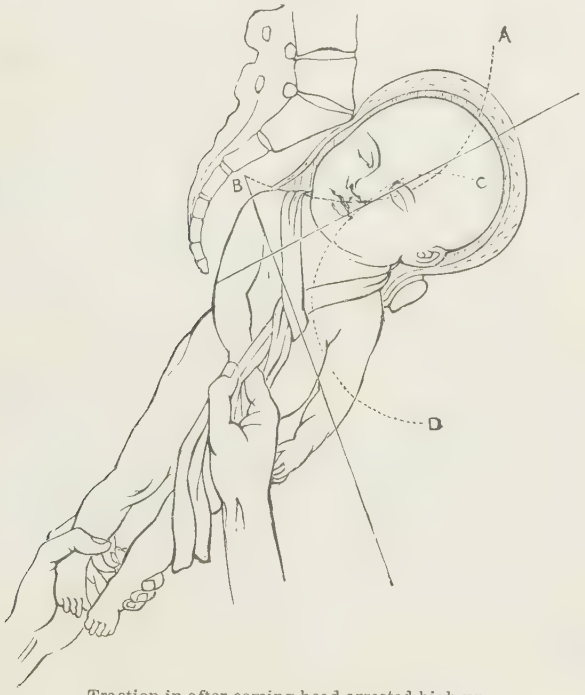


Arrest of head at superior strait: method of delivery. (WINCKEL.)

may first be tried. When the woman is on her back and brought to the edge of the bed the traction should be almost directly downward, toward the coccyx; and the manual pressure on the abdomen from above should be chiefly on the *frontal* pole of the head to secure flexion. When an assistant is present to make abdominal pressure the obstetrician may draw on the shoulders with one hand, while two fingers of the other are passed up into the child's mouth and traction

made on the jaw. Thus three expedients act simultaneously, viz., *abdominal pressure, shoulder traction,* and *jaw traction.* (See Fig. 111.) Should these fail, forceps may be used to bring the head into the pelvic cavity. Forceps are also advisable when the head is detained by a resisting os or cervix

FIG. 112.



Traction in after-coming head arrested high up.

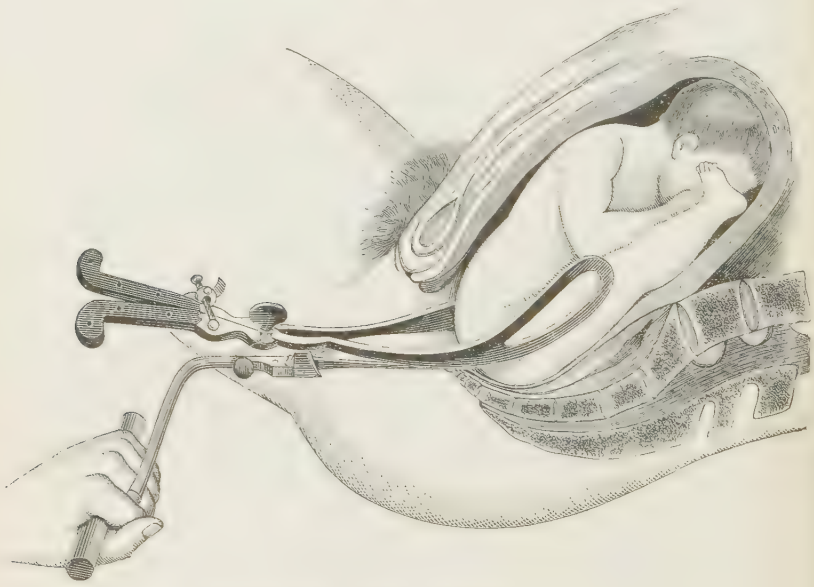
uteri, but great care is necessary to avoid laceration of cervix. In these cases Dr. Barnes recommends backward traction by the feet and upon the nape of the neck by encircling the latter with a fine napkin or silk handkerchief, as shown in Fig. 112.

In any case where delivery of after-coming head is delayed, and weakness of umbilical pulse with spasmodic contraction

of child's respiratory muscles indicate impending suffocation, we may enable the child to breath before birth by passing in two fingers between the face and vaginal wall, thus making a channel for air to the mouth or nostrils, or a large catheter may be passed into the mouth. In one case life was saved by *tracheotomy* before delivery.

In all cases of breech presentation every means necessary for the restoration of suspended animation in the infant should be provided beforehand.

FIG. 113.



Tarnier's forceps applied to the thighs. (OLLIVIER, LUSK.)

In cases of *unusual* delay during *early* stages, *accompanied with symptoms of exhaustion*, and due to a large breech, small pelvis, or some other abnormity, a finger, blunt-hook, or fillet may be passed over the groin and used for traction.

If possible to reach a foot, it may be pulled down. Forceps and the vectis have been employed; their use is questionable. They may be tried, however, before embryotomy, which

may, very rarely, become a last resort in bad cases of impaction.

Occasionally, owing to obliquity of the uterus, the breech, as it were, *sits on the edge of the pelvic brim*, instead of presenting over its centre. Progress is impossible. *Treatment:* Relieve by manual pressure over abdomen, or put a hand in the vagina and lift the breech off the side into the middle of the brim. Combine both manipulations.

FIG. 114.



The fillet in dorso-anterior positions. (LUSK.)

Treatment when legs are extended.—These are exceptional cases, and often occasion difficulty and danger. Should the diagnosis have been made early, before the breech has descended below brim of pelvis, and before the bag of waters has been discharged and the womb contracted round the child, cephalic *version*, by *external manipulation*, is best. This early diagnosis is difficult, and usually not attempted soon enough. It can scarcely be reached except by mapping out the child

by palpation over the abdomen. Failing to bring down the head thus early, by external manipulation, the next expedient is to pass the hand inside, all *the way to fundus uteri*, and bring down the feet—a mode of proceeding, at best, difficult, and endangering rupture of uterus, especially after waters have been evacuated. When breech has descended into pelvic cavity, or become impacted, version should be abandoned. The expedients *now* at our disposal, named in order of preference, are: *forceps, fillet, blunt-hook, cephalotribe.* Experience has amply demonstrated that forceps (made for the head) may be also safely applied to the breech when it has engaged in the pelvic cavity, and the os uteri is dilated. When hips have rotated (one to sacrum and one to pubes) one blade of forceps is applied to sacrum of child, the other to *posterior* surface of child's thighs. When hips have *not* rotated, but remain transverse, the blades are applied to the *lateral surface* of the *thighs* (see Fig. 113, page 278), not over the trochanters, so that ends of blades impinge upon crests of ilia. Traction only during pains, slowly and without great force, assisted by pressure of hands of assistant over fundus uteri through abdomen. Should forceps fail, or breech be too high up to admit of their application, and version be impracticable without using dangerous force, pass *fillet* over groin, in preference round the thigh directed anteriorly, and make traction (see Fig. 114, page 279) until breech is low enough for forceps, or for fingers to be hooked in groin: the whole hand may be passed into the vagina and be made to grasp breech bodily, a thumb in one groin and fingers over opposite trochanter. The *blunt-hook*, properly guarded, may be of service, passed over groin for traction. Its use requires skill and caution to prevent injury to child as well as mother. In impaction cases where all these methods prove to be unavailing, *symphyseotomy* should be done if the child be alive. When child is dead, or other measures have failed, use *cephalotribe*, applying it tightly to breech, and extract during pains by judicious traction.

Treatment of Footling and Knee Cases.—The management of these cases is practically the same as in breech presentation. So is the mechanism. Most cases *were* breech presentations originally, the presenting foot having been displaced downward toward the os uteri, either by the active

motions of the child or by a gush of liquor amnii when the waters broke, or by some other process. Rarely, labor *begins* with the heels placed against the buttocks, the lower extremities having the same relation to the body as is observed in a kneeling posture. Footling cases are often more tedious than when the breech presents; the small and irregular-shaped feet (or knees) do not so well adapt themselves to the shape of the os uteri, hence dilatation of the latter is slow and labor painful. There is more danger to the child during delivery of the after-coming head, for the feet, hips, and body come through the os uteri without producing sufficient dilatation of the os to admit the head afterward.

Whether one or both feet present, and whether at the os uteri or at the os vaginæ, either before or after rupture of the membranes, the *best rule of treatment* (in the absence of any complication) is to leave the case alone—taking special care *not* to rupture the bag of waters—until the hips are delivered, when active interference may be necessary, as described in the management of breech cases, to prevent fatal delay with after-coming head. (See pp. 273 and 274.)

Occasionally, unusual and serious delay may occur when the presenting parts are at the superior strait, owing to a foot or knee being caught over the edge of the pelvic brim, preventing descent. The obstructing limb should be placed right, or hooked down, with the finger. Since in doing this there is a risk of rupturing the membranes (be they still unbroken), try frequent changes in the woman's posture; this alone will sometimes remedy the difficulty.

Complex presentations, of a foot alongside of the head or face; or of a foot and hand; or of a foot and a hand with the head or face, etc., may require interference. When the head or face present, try to push back the accompanying hand or foot. Failing in this, the foot may be held down by a fillet, while the head (or face) is pushed up, and version performed, converting the case into a pelvic presentation. Should this be impossible, the head (or face) may be extracted by forceps, while the offending limb remains down. Should all fail, craniotomy may be necessary.

When hand and foot present alone—*i. e.*, without the head or face—pull down the foot and push up the arm—really podalic version, as in arm presentation.

CHAPTER XVII.

TRANSVERSE PRESENTATIONS.

Any presentation in which the child's body lies transversely *across* the pelvis, instead of *endwise*, is a "transverse presentation;" hence presentations of the arm, shoulder, elbow, side, back, abdomen, etc., are all included in this class. Sometimes called "trunk" and "cross" presentations. They occur once in about two hundred and fifty labors.

For practical purposes it is only necessary to study *two* transverse presentations, viz.:

1. *Right* lateral presentation (including right arm, shoulder, elbow, hand, etc.).
2. *Left* lateral presentation (including left arm, shoulder, etc.).

Fig. 115.



Left cephalo-iliac (or dorso-anterior) position of *right* shoulder.

Fig. 116.



Right cephalo-iliac (or dorso-posterior) position of *right* shoulder.

Each of these two *presentations* has two "positions," viz.:

1. *Right* cephalo-iliac (the head, or "cephalic" end of the child, resting upon the *right* ilium).
2. *Left* cephalo-iliac (the "cephalic" end of the child resting upon the *left* ilium).

Since, in the *right* cephalo-iliac "position" of a *right* lateral "presentation" (Fig. 116), and in the *left* cephalo-

iliac "position" of a *left* lateral "presentation" (Fig. 118), the back (*dorsum*) of the child is directed toward the *posterior* wall of the pelvis, these two positions have also been called "*dorso-posterior*" ones; while the other two positions, in which the *dorsum* of the child is directed toward the pubes (Figs. 115 and 117), are called *dorso-anterior*.

Presentations of the *abdomen* and *back* are very rare, and soon become changed, *spontaneously*, into *lateral* presentations, or they *must* be so changed *artificially*.

FIG. 117.



Right cephalo iliac (or dorso-anterior) position of *left* shoulder.

FIG. 118.



Left cephalo-iliac (or dorso-posterior) position of *left* shoulder.

In cross-presentations the child is seldom or never *exactly transverse*, but obliquely placed; the *head* is *usually* lower than the breech, as shown in the figures, hence they are sometimes called "*oblique*" presentations.

MECHANISM OF TRANSVERSE PRESENTATIONS.—There is *no* mechanism; at least for *practical purposes*, it may be considered that natural delivery in cross presentations is *mechanically impossible*.

Actually, however (so wonderful are Nature's resources), there are *two* processes by which, in *exceptional* cases, delivery *may* occur spontaneously; but they are neither sufficiently safe nor frequent to be relied upon or waited for in practice. These are "*spontaneous version*" and "*spontaneous evolution*."

SPONTANEOUS VERSION.—That end of the fœtal ovoid nearest the pelvic brim (one end generally *is* so, for the

child's body lies *obliquely* across the pelvis, seldom *exactly* transverse), under the influence of uterine contraction, gets lower and lower, and the other end higher and higher, until, finally, the lower end slips over the edge of the brim into the

FIG. 119.



Chiara's frozen section, representing arrested spontaneous evolution.

pelvic cavity, and the presentation has then become longitudinal, either a head or breech. This process is most apt to occur in multiparous women, with feeble uterine contraction, and *before* rupture of the membranes; it is sometimes

called "*spontaneous rectification*," those who use this term reserving the expression "*spontaneous version*" for cases in which that part of the child directed toward the fundus is turned downward to the pelvic brim. This latter proceeding occurs most frequently *after* rupture of the membranes in women with powerful contractions of the uterus. In this the os uteri is spasmodically contracted, so that while no downward progress of that end of the fœtal ovoid nearest the brim can take place (it, on the contrary, glides laterally and upward), that end of the child *nearest the fundus* is forced all the way down to the pelvic brim, and a head or breech presentation results.

While spontaneous rectification and version are usually ascribed to uterine contraction, it is probable that they are promoted by antero-lateral pressure of the woman's thighs upon the abdomen, when she assumes a sitting, kneeling, or squatting posture.

FIG. 120.

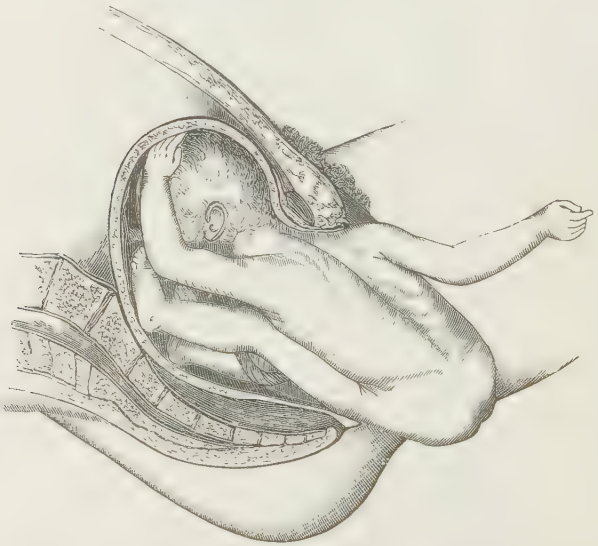


Spontaneous evolution. First stage.

SPONTANEOUS EVOLUTION.—The child's body remains cross-wise to the pelvic brim. The head rotates (*above* the

brim) toward the nearest acetabulum, the breech toward the opposite sacro-iliac synchondrosis. The arm is extended from the vagina, the shoulder descends into the pelvic cavity, the neck rests behind the symphysis pubis. The body is then doubled laterally on itself, breech and head approaching each other (just as one might press together the two ends of a sausage), while the rounded, convex angle of duplication is forced down through the pelvic cavity to the inferior strait. The side of the child (the side of its *chest*) is born first, followed by breech, legs, and feet, which are successively forced

FIG. 121.



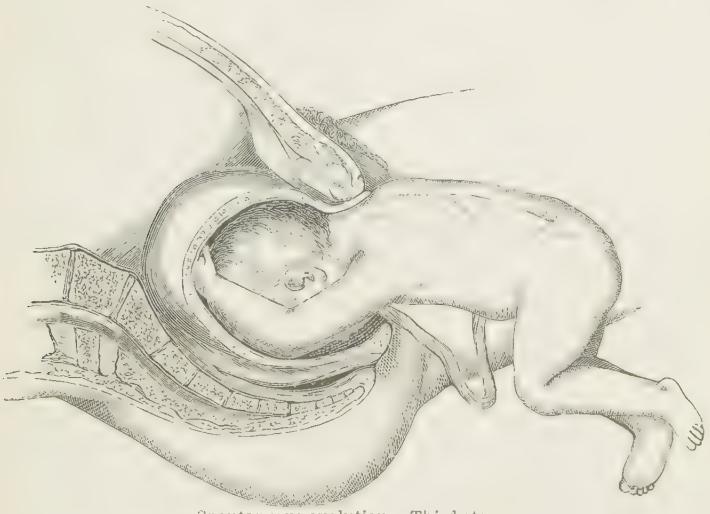
Spontaneous evolution. Second stage.

down along the sacrum and emerge at the perineum. Unless the pelvis be large, the child small, and uterine contraction strong, fœtal impaction is apt to occur, or the child is born dead from the prolonged and violent compression to which it has been subjected. See Fig. 119, page, 284 representing a case as exhibited by frozen section of cavader (after Barnes).

When the process is successful its several stages are those shown in Figs. 120, 121, and 122.

Very rarely a process of spontaneous evolution (different from that just described) occurs, in which the child is *delivered* with *doubled body*—"*evolutio conduplicato corpore.*" Instead of remaining above the brim, the *head enters the pelvis with the body,* into which it is deeply pressed, so that head and abdomen come together, followed successively by breech and legs. The second arm lies between the head and breech. In

FIG. 122.



Spontaneous evolution. Third stage.

the other more common mode of evolution, the body was *un*doubled during delivery, body coming first, head afterward; in the rare form, body and head *remain doubled* and come together. This last only occurs with premature or macerated infants, or in abortion cases. Delivery is hastened by traction on the arm.

CAUSES OF TRANSVERSE PRESENTATION.—Prematurity of the labor. Placenta prævia. Narrowness of pelvic brim. Great lateral obliquity of the uterus. Multiple pregnancies. Undue mobility of the child from excess of liquor amnii. Accidental pressure externally from blows, falls, dress, etc.

Repeated occurrence of cross-births in the same woman is probably due to a narrow pelvic brim.

Diagnosis of Transverse Cases.—By external palpation and inspection the womb is found to be unsymmetrical in shape, and longer transversely or obliquely than vertically. Since in the *large majority* of cases the back of the child is *in front* (dorso-anterior position), and the *head lower* than the breech (at least early in labor or before it begins), one may inwardly *guess* (often correctly) both presentation and position by *inspection alone*. *Palpation* in *dorso-anterior* positions reveals hard, round, regular tumor of head on one iliac fossa, and soft, irregular tumor of breech high up in opposite flank, partly concealed behind false ribs or by the liver. Resisting plane of back follows curved line between these two. Above the resisting plane, toward the breech, are felt the small parts in elastic space occupied by liquor amnii. The excavation usually empty, or small projection of presenting shoulder may be discovered behind horizontal rami of pubes beginning to sink into brim. The head on the iliac fossa may be made to ballot. *These are the conditions observed early in labor or before it begins.*

Later in labor, after membranes are ruptured and child's body becomes compressed by contracting uterus, the line of resisting plane of back becomes more vertical; the breech is forced more over to the median line, and plane of back appears to join head tumor almost at right angles.

In dorso-*posterior* positions (extremely rare) palpation reveals hard globe of head in one iliac fossa, and large, soft, irregular breech high up on opposite side. Resisting plane of back (being behind) cannot be felt, or only with difficulty; while elastic space of liquor amnii and small parts (being in front) are *felt easily*.

By vaginal examination, early in labor, the presenting part and os uteri are found high up and difficult to reach. The bag of waters is elongated in shape, sometimes projecting through the os like a glove-finger. The globe of the head is missing. Vaginal examinations should be made *between* the pains to avoid rupture of membranes.

Diagnosis of Shoulder Presentation.—By its rounded prominence; the sharp border of its acromion process; the

clavicle; the spine of the scapula; the hollow of the axilla; and especially by proximity of *ribs and intercostal spaces.*

DIAGNOSIS OF ONE SHOULDER FROM THE OTHER WHEN THE HAND AND ARM ARE NOT TANGIBLE.—1st. Observe the opening of the axilla; it always points toward the child's feet. If the feet be, therefore, toward the *right* side of the pelvis, the *head* will be toward the *left* side.

2d. The scapula, its spinous process especially, will indicate whether the child's back be toward the pubes or toward the sacral promontory.

3d. A moment's reflection will show that a child lying across the pelvis (let the reader imagine *himself* to be lying across it), with its *head* in the *right* iliac fossa, and its *back* to the *pubes*, *must* be presenting its *left* shoulder to the pelvic brim—the "position" of the "presentation" being, necessarily, right cephalo-iliac (dorso-anterior). If the axillary opening show the head to be in the *left* iliac fossa, and the position of the scapula show the child's back to be toward the mother's sacrum, it will still be the left shoulder presenting, the *position*, however, being left cephalo-iliac (or dorso-posterior).

The same data and deduction may be used for the right shoulder and its two "positions."

DIAGNOSIS OF ONE SHOULDER FROM THE OTHER WHEN THE ARM IS IN THE VAGINA.—Grasp the child's hand as in ordinary hand-shaking. When the palm of the hand of the practitioner and the palm of the child's hand are brought flat against each other, if the *thumbs of the two hands come together* the hand of the child will be right or left according as the physician is using his right or left.

Again, if the infant's hand be at the vulva, and its palm be turned up toward the symphysis pubis, the thumb will point toward the right thigh if it be the right hand, and to the left thigh if it be the left.

DIAGNOSIS OF THE "POSITION" OF THE "PRESENTATION" BY THE PRESENTING HAND.—*Extend* the arm, and place the hand *supine*. The thumb will then always point toward the head, and the face of the palm will agree with the surface of the child's abdomen.

Diagnosis of the Elbow.—By its three bony projections —the two condyles of the humerus and the olecranon process of the ulna. The *end* of the elbow, like the axillary opening, points toward the child's feet.

Prognosis of Transverse Cases.—Always serious. Often fatal to the child, sometimes to the mother. Much depends upon the presentation being corrected early, and upon the skill of the operator.

Treatment.—Early correction of the presentation—converting it into a head, breech, or footling—by the operation of version or turning. This may be done either by *external* manipulation; *internal* manipulation; or by a combined modification of both methods, known as *bipolar* version.

(*Note.*—Version, and the several modes of performing it, will be considered in Chapter XIX).

CHAPTER XVIII.

INSTRUMENTAL DELIVERY, FORCEPS, ETC.

There are four great divisions of operative midwifery—four great methods by which delivery may be accomplished when the natural powers fail. These are:

First. Delivery by forceps.

Second. Delivery by version.

Third. By cutting operations upon the mother.

Fourth. By mutilating operations upon the child.

Each of these includes a variety of different procedures, and there are numerous other minor manipulations (some of which have been already described, and others remain to be considered), which are, of course, obstetrical operations in every sense; but it is when these minor methods are inefficient that the obstetrician falls back upon one or other of the four great methods of delivery just mentioned. Delivery by *forceps* and by *version* are essentially *obstetrical* operations; cutting operations upon the mother are distinctly *surgical*,

and mutilating operations upon the child are awkwardly of a mixed character. Some recent authors have included *all* operations under the caption of "*Obstetric Surgery.*"

It is important to know that *forceps* and *version* are far more frequently required than the other two methods, and will be resorted to occasionally by almost every medical practitioner; while cutting operations upon the mother, being so rare as scarcely to allow the obstetrician to acquire skill in their performance by experience, ought, in the interests of the patients, to be done by one already possessing surgical skill, when such can be obtained without injurious delay. Under opposite circumstances every obstetrician should know how to do these operations, and not hesitate in undertaking their performance himself. Mutilating operations upon the child are seldom required, at least in this country where pelvic deformities (their chief field) are comparatively infrequent. While they demand care, manual dexterity, and deliberation in their performance, to avoid wounding the mother, they are done without hemorrhage (at least from the living) and are therefore exempt from that "fear of blood" which is apt to unnerve and disturb the self-possession of one unaccustomed to perform surgical operations. In the interests of living children they are being largely supplanted by improved methods in doing cutting operations upon the mother.

Forceps, Vectis, Blunt-hook, Fillet.—A description of the forceps may be fittingly preceded with a brief account of the other instruments here named. The *fillet* is a noose of cotton, silk, or leather tape, or an uncut skein of worsted, used for traction. The loop having been passed around the part to which it is to be applied, the other end of the fillet is put through the noose and drawn to form a slip-knot. The whalebone fillet consists of a long slip of this material, the ends of which are bent toward each other and joined in a solid handle. A good fillet may be made by passing a strong piece of tape through a piece of stout rubber tubing, the tape being sewed to the tube at each end, where it projects a sufficient length to admit of a knot being made to facilitate introduction, etc. The fillet is seldom used except for the occasional assistance it may render in certain arm and breech cases already mentioned. If the end of the fillet cannot be passed by the finger, use a large gum-elastic catheter with

stylet, bent to suit the case, with a piece of tape fastened to its extremity. When the catheter is in position the fillet may be fixed to the tape and drawn through as desired.

The *blunt-hook* is a cylindrical rod of steel, one end of which is attached to a wooden handle, and the other bent to form a hook, in the end of which is an "eye" through which

Fig. 123.



Vectis.

Fig. 124.



Short forceps (Denman's).

a fillet may be threaded. It is used as a sort of long *artificial finger* for passing the fillet and making traction; it is but little employed for delivery of living children on account of injury it is apt to produce; but becomes of great service in the extraction of dead ones during embryotomy operations.

The *vectis* is a flattened steel blade with a fenestra, shank, and handle resembling a single blade of the straight forceps,

and curved to fit the contour of the fœtal cranium. (See Fig. 123.) It is seldom used, but may be of service, as a sort of *artificial hand*, in promoting flexion, rotation, and extension, when necessary in the mechanism of labor. As a tractor it has become obsolete since the invention of forceps.

FIG. 125.



Long forceps (Hodge's).

FIG. 126.



Simpson's long forceps.

The *forceps* is a sort of pincers whose blades, like a *pair of artificial hands*, grasp the head and draw it through the pelvic canal.

The instrument is composed of the *blades* proper (which

grasp the head), the *lock* (where the two halves of the instrument cross each other and are "locked" together), the *shank* (placed between the lock and blades to give length to the contrivance), and the *handles* (which are held by the operator). The two halves of the instruments are separately known as the "right" and "left" blades, called also "upper" and "lower," and "male" and "female" blades.

Forceps are either "short" or "long." The *short forceps*, called also "straight," have only one curve—the *cranial* curve, which adapts them to fit the cranium. They are only used when the head is at the inferior strait or low down in the cavity of the pelvis. (See Fig. 124, page 292.)

The *long forceps*, beside the "cranial" have also a "pelvic" or "sacral" curve, by which they conform to the axis of the pelvic canal. (Figs. 125 and 126, page 293.) They may be applied at almost any part of the pelvis.

Action of Forceps.—They act chiefly as *tractors;* slightly as *compressors;* scarcely at all as *levers.* They are aids to, or substitutes for, uterine contraction. They occupy but little space, owing to projection of the parietal protuberances through the fenestræ of the blades, which always occurs when the instrument is applied in its most favorable position, the long diameter of the head agreeing with the long direction of the blades.

Cases in which Forceps are to be Used.—Generally speaking, in all cases where it is necessary to hasten delivery, provided their use for this purpose can be safely and successfully employed. The circumstances under which their application is to be preferred to other modes of operating, and the cases to which they are especially adapted, are so varied and numerous that they need not be recited here; they are considered elsewhere in connection with the different kinds of labor and their complications.

The "High" and "Low Operation."—When the head (or face) of the child is at the inferior strait, or low down in the pelvis, it constitutes the "low operation," and is comparatively easy. When the head is at or above the superior strait, or occupying the higher planes of the pelvic cavity, it is the "high operation." This distinction is important.

Difficulty and danger of forceps operations increase, *cæteris paribus*, from below upward.

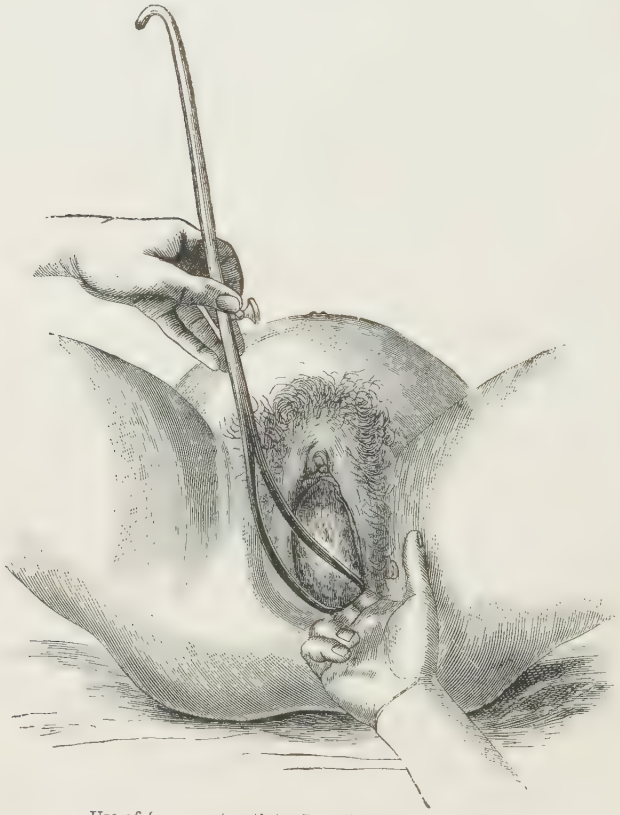
Conditions Essential to Safety in Delivery by Forceps.—The os uteri must be dilated; the membranes ruptured; the rectum and bladder empty; the pelvis of sufficient size to admit the child; and the operator must possess a requisite amount of knowledge, strength, and manipulative dexterity. Forceps, however, may be applied *before* the os uteri is completely dilated (if it be patulous and dilatable), and before the head has passed through it, provided the dangers of delay are manifestly greater than the risks incurred by introducing the blades of the instrument into the uterus.

Antiseptic Preparation.—Make the abdomen, thighs, and vulva aseptically clean by scrubbing with soap and water and applying a 1 : 2000 bichloride solution. Cleanse the vagina thoroughly with a hot 2 per cent. creolin solution. The hands of the operator are prepared aseptically as usual. (See "Labor," page 202). The forceps are rendered sterile by boiling and placed in a 5 per cent. carbolic acid solution —preferably in a deep pitcher—ready for use. Before introducing each blade lubricate it with carbolized vaseline or mollin, 5 per cent. Aseptic needles and sutures will have been previously prepared for the perineum as a matter of course.

Mode of Application at the Inferior Strait when the Occiput has Rotated to the Pubic Symphysis.—This is the simplest and most easy of all forceps operations. Place the woman on her back as already described for version. Anæsthesia may or may not be necessary, according as the pain and difficulties to be anticipated are, respectively, great or little. Assistants, at least one even in the simplest cases, will be required, but an intelligent nurse will often be sufficient. When anæsthesia is used, additional assistants become necessary: one to give ether and two others (one on each side) to support the lower limbs. The "left" ("male," "lower") blade is introduced first. Which of the two blades this *is* may be ascertained as follows: Before they are taken apart look at the lock of the instrument, while it is held with the convex border of the sacral curve downward and the handles toward you, and ascertain which shank is uppermost: it is the one

whose handle is toward your right hand (the "upper," "female," "right" blade). Lay it aside: the other blade, held in the left hand, must be introduced first. Grasp it just above the lock, much in the same manner as you would a pen,

FIG. 127.

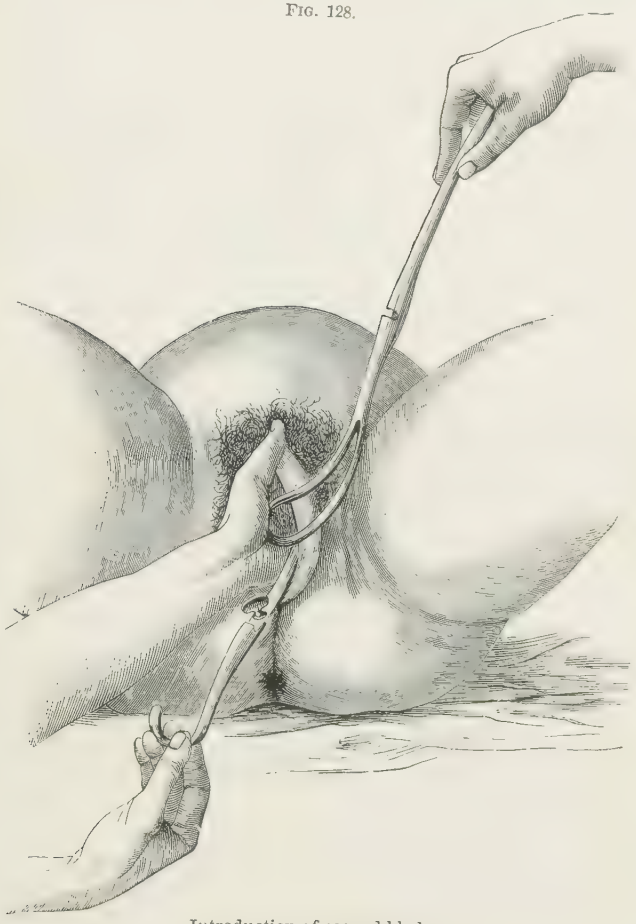


Use of forceps at outlet. Introduction of first blade.

so that the handle rests between the thumb and the index-finger, and upon their junction. One or two fingers of the *right* hand are now *first* introduced between the child's head

and left lateral wall of the vagina, and retained there, while the end of the blade is placed against their palmar surface,

FIG. 128.

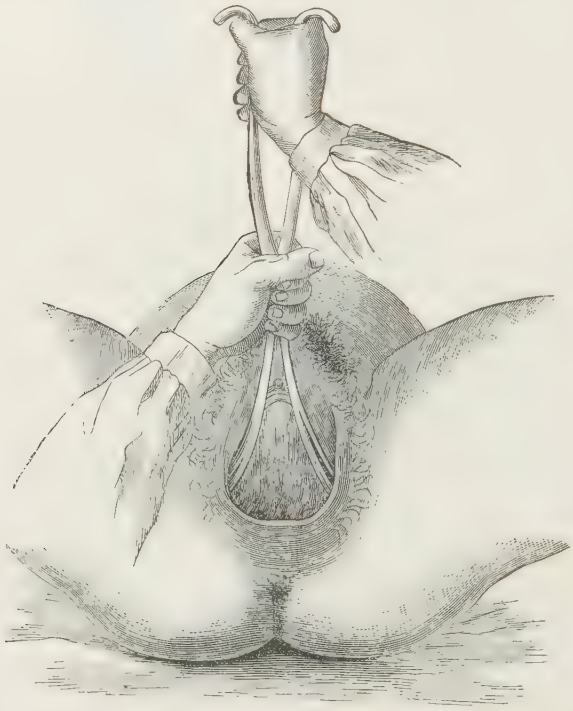


Introduction of second blade.

and by gentle pressure made to glide in and up between the head and fingers. (See Fig. 127.) At first the end of the

handle is directed rather toward the right thigh, but is gradually brought further down and toward the median line as the blade ascends the vagina. A gentle, *limited*, up-and-down movement of the blade, rocking it first up toward the pubes, then down toward the coccyx, may facilitate its entrance

FIG. 129.



Lifting handles to follow extension.

when the size of the head makes it a tight fit. The fingers inside, having ascertained that the blade is entering properly, are gradually withdrawn; and when the end of the instrument has about passed the equator of the head the left hand is placed above and nearer the end of the handle, which is now depressed toward the perineum, where it is held steady

by an assistant, while the other blade, held in the right hand and preceded by two fingers of the left, is introduced along the right lateral wall of the vagina on the other side of the head, in an exactly similar manner as the first. (See Fig. 128.) When properly applied, the second blade crosses the first one near the lock. The next step is to lock them.

The operator, taking a handle in each hand, by slight adjusting movements gets both blades on a proper level, the lock slips into position, and the instrument is ready for traction. In forceps, like Hodge's, having a screw lock, the screw must be tightened before performing traction. In *applying* the forceps, proceed only *between* the pains; in using *traction*, only *during* the pains. In the absence of pains, imitate them by intermittent tractions and intervals of rest: each continuous pull not to be longer than one minute. In drawing out the head by traction, avoid haste and violent pulling (unless imperatively required); draw by the strength of the hands and arms, not by hanging the weight of the body on the instrument; direct traction in a line with the axis of the pelvis. While one hand grasps the handles let the other grasp the lock, and rest the tip of its index-finger against the occiput to guard against the head slipping out of the blades; in resting from traction-efforts between the pains, see that the handles are *not* held tightly together, so as to make *continuous* compression, by the blades, upon the head. Keep the handles down, so that traction is made about in a horizontal line, until the occipital end of the occipito-mental diameter is beginning to escape under the pubic arch, then gradually lift them up, in a line with the axis of the outlet, toward the mons veneris, in order that "extension" of the occiput up in front of the pubic symphysis may take place. (Fig. 129, page 298.) Inexperienced operators *usually* continue traction too long before beginning extension. When occiput is well below pubic arch and back of child's neck behind pubes, pulling does no good; extension, by lifting handles toward pubes, must now begin. Watch the perineum and guard it from rupture as the biparietal equator emerges. Readjust the instrument from time to time without withdrawing it, if necessary, to keep the long direction of the blades parallel with the long diameter of the head (especially during "extension"), otherwise the terminal extremities of the blades will project and injure the perineum or vagina. To avoid this risk more

completely, some operators take off the instrument, just before the head emerges, and finish delivery, if further artificial aid be necessary, by manipulation—a finger introduced into the rectum drawing on the chin.

Oscillatory or "Pendulum Movement." — During traction it is *not* necessary (as was formerly supposed) to sway the handles to and fro, laterally, with a view of levering the head out of the pelvis as a carpenter "rocks" a nail in withdrawing it from a board. Since there is no rachet-like roughness either to the pelvic canal, forceps, or head, nothing can be gained by this movement, while the sweep it necessarily gives to the ends of the blades may injure the soft parts. In certain cases where the head is fixed and firmly impacted in the pelvis, such a motion may be justifiable to dislodge or loosen it, but after this the lateral movement is useless.

Authorities differ on this matter; some continue to practise the pendulum movement, and explain the theory of its action satisfactorily to themselves; others do not.

Since the pinch is most often in the *antero-posterior* diameter of the pelvis, the *lateral* movements would seem merely to swing the head from side to side round a central pivot running from sacrum to pubes. Theoretically the to-and-fro movements would appear to be called for *in the other direction* —antero-posteriorly, in order to lever the head down through the two ends of the obstructing conjugate.

Applications of Forceps at Inferior Strait when the Occiput has Rotated to the Sacrum.—Forceps should not be applied at all in these cases, until a reasonable time has been allowed and every proper effort made (see page 246) to promote anterior rotation, unless, indeed, accidental circumstances render delay dangerous. Then, however, the operation is as follows: The blades are put in exactly as described for cases where the occiput has rotated anteriorly. But since the occiput is now toward the sacrum, the *extension will, of course, be downward and backward over the perineum*, instead of upward toward the pubes; hence the handles of the instrument, at first lifted somewhat upward toward the pubes to draw the occiput up to the edge of the perineum, must, when the head emerges, be directed *downward and backward*, instead of toward the *mons veneris*. A moment's reflection

will show that the short *straight* forceps (without any *sacral curve*) should be used in these cases; for the said curve is only adapted to follow the axis of the pelvic canal, but during *backward* extension of the occiput over the perineum the head departs from the axial line and goes in an almost opposite direction. If the *curved* forceps were used, the ends of the blades would impinge against the pubic arch while the handles were being depressed in following the movement of backward extension. Again, owing to the depth of the posterior pelvic wall being three times as great as that of the anterior one, there is so much the more difficulty in getting the occipital end of the occipito-mental diameter to escape over the edge of the perineum, hence greater danger of laceration, and necessity for extra care that the occipital pole *really* shall have cleared the perineum before extension is attempted.

In the cases of occipito-posterior rotation, in which the forehead, face, and chin successively escape under the pubes (which sometimes goes on while the forceps are being used), the case becoming a face presentation at the last moment (see "Mechanism of R. O. P. Position," page 244), the handles are elevated toward the pubes, for, the chin having emerged, the mechanism is completed by its *flexion* up toward the *mons veneris*.

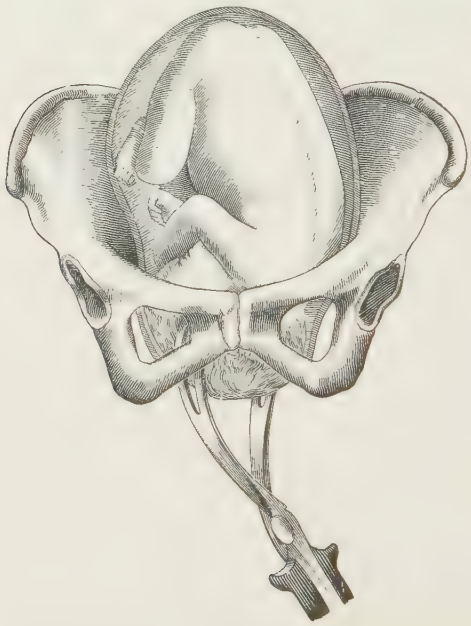
Application of Forceps at Inferior Strait when the Occiput is Toward one of the Acetabula.—Here *no* rotation has occurred. The long diameter of the head occupies the same oblique diameter by which it entered the superior strait.

As a general rule, apply the blades just as if rotation *had* occurred, for, during the subsequent traction, *rotation will take place inside the instrument*. The blades conform to the *sides of the pelvis*, but grasp the *head obliquely*, one over the *side* of the forehead, the other over the *side* of the occiput. They do not so nearly approach each other, hence the handles are wider apart, and the forceps are more apt to slip during traction—an accident to be avoided by additional care.

Another mode of operating is to place the blades over the *sides* of the unrotated *head*, one blade being passed in along the sacro-iliac synchondrosis, the other near the opposite acetabulum. When the instrument is thus adjusted, the handles will be directed decidedly toward that thigh corre-

sponding with the acetabulum at which the occiput is placed. (See Fig. 130.) Before or during the first traction-efforts the occiput is made to rotate to the pubes by gently directing the handles to the median line of the inter-femoral space. This mode of operating, while more scientific and desirable than the other, requires, in most cases, a special skill, and from its difficult execution is not resorted to as often as the simpler method first above given.

Fig. 130.



Forceps applied at inferior strait: occiput to *left acetabulum.*

In doing the operation the thighs must be forcibly flexed to get them out of the way of the handles of the instrument.

When the occiput is to *left* acetabulum apply *lower* blade *first* along left sacro-iliac synchondrosis; then second blade behind right acetabulum.

When occiput is to right acetabulum it is best to apply the *upper* blade first, along right sacro-iliac synchondrosis, and holding its handle up and on one side, out of the way, put in second blade underneath it, behind left acetabulum.

Application of Forceps at Inferior Strait when the Occiput is Toward one of the Sacro-iliac Synchondroses.—This is still more difficult than in unrotated *anterior* positions, but the two modes of operating just mentioned for them may here be employed (preferably the first one), noting the difference (when the second method is attempted) in the *direction* of rotation, viz., backward to the sacrum, instead of forward to the pubes. As before stated, every effort should have been previously made to rotate the occiput *to the pubes;* failing in this, there is nothing left but to rotate it to the sacrum, and deliver it in accord with mechanism of occipito-posterior positions.

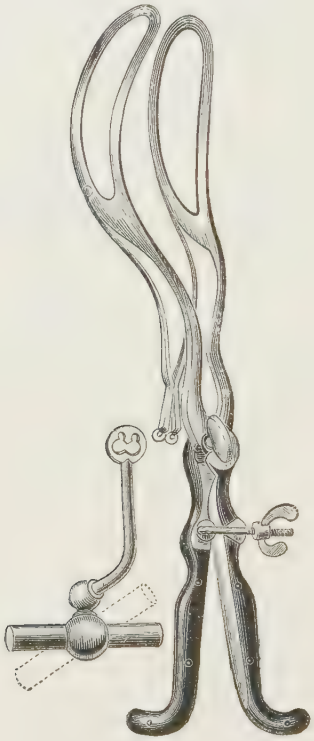
Application of Forceps when the Head is in the Pelvic Cavity between the two Straits.—General methods the same as already described. The instrument requires to be passed further up (hence long, curved forceps are necessary), and the traction must be made more in a backward direction, in conformity with axes of higher planes of pelvic canal, by directing the handles more decidedly downward toward the perineum while pulling efforts are being made.

In these cases, as in all others where the head may not have passed entirely through the os uteri, the fingers that precede the introduction of the blades should feel that the ends of the instrument *certainly* pass between the head and the lips of the os, and not outside the latter so as to pinch it between the head and blade.

The "High Operation"—at or above the Superior Strait.—It is very difficult. In many instances podalic version is safer and easier if the conditions favorable for it be present. When the head has not sufficiently descended to fix it in the brim, but remains movable above the superior strait, version is usually preferable. The forceps is introduced in the usual manner, but, of course, higher up, so that even the lock may enter the vulva. The blades follow the *sides*

of the pelvis, no matter what "position" the head may occupy, hence they grasp the latter obliquely, and there is great liability to slipping of the instrument, and danger of the tips of the blades injuring the interior of the uterus.

FIG. 131.

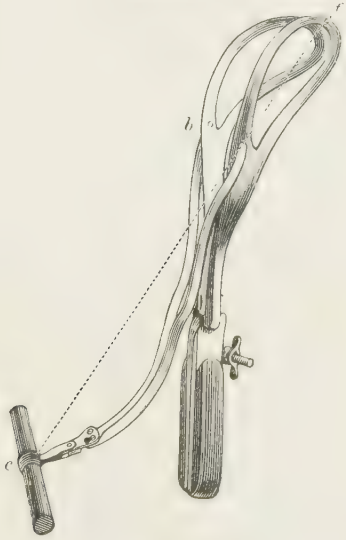


Lusk's modification of Tarnier's forceps.

Traction must be made very slowly at first, and *decidedly backward* and downward in line with the *axis of the plane of the superior strait,* by keeping the handles as near the coccyx as possible. To facilitate this backward traction, Tarnier has

constructed a special instrument (Fig. 131, page 304) with curved handles, perforated by a screw to hold the blades in contact with the child's head; these handles steady the instrument and indicate the *direction* of traction; the *force* of traction is applied to the lower handle, or cross-bar, attached to the traction rods fastened to the blade at *b* (Fig. 132). The

FIG. 132.



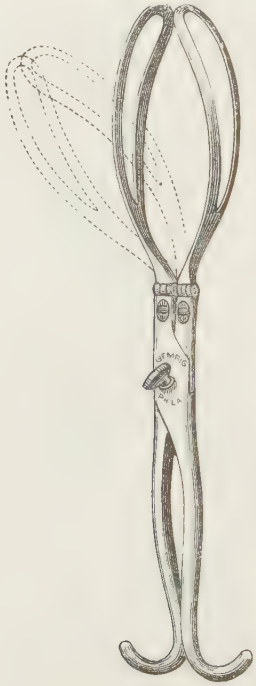
Simpson's axis-traction forceps.

direction in which axis-traction can be thus employed is well illustrated by the dotted line in Fig. 132, showing Simpson's modification of Tarnier's instrument. An hour may be required to bring the head down to the pelvic floor, and care must be taken to direct it in accordance with the natural mechanism of labor as far as practicable; and also that the traction consist of alternate pulls and pauses, in imitation of natural labor pains.

Recently *Walcher's position* has been used in these difficult cases to increase the conjugate diameter of the superior strait. The woman is placed on her back with her hips not simply

at, but projecting *over* the edge of the bed, her legs to hang down toward the floor without any support whatever. The bed—preferably a table—must be sufficiently high to prevent the woman's feet touching the floor. This slightly lengthens the distance between the sacral promontory and symphysis pubis. When the head reaches the inferior strait the lower

FIG. 133.



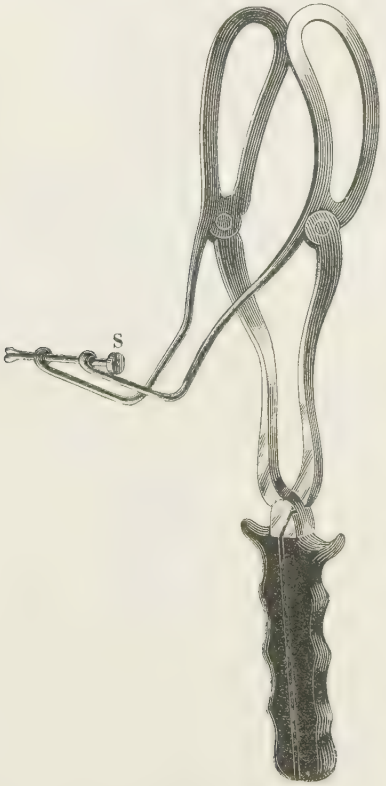
McFerran's forceps.

limbs must be supported and flexed as usual. While Walcher's posture *lengthens* the conjugate of the *inlet*, it *lessens* that of the *outlet*. Various other devices have been contrived for securing axis-traction, notably the forceps of Dr. McFerran, of Philadelphia (Fig. 133), and Breus's axis-traction instrument (Fig. 134.)

Prof. Stephenson, of Aberdeen, uses a steel rod hooked in front of the lock, as shown in Fig. 135, page 308.

A still better device is the traction rods of Dr. Reynolds —two separate steel rods hooked into the fenestræ of the

FIG. 134.



Breus's axis-traction forceps.

blades after their introduction, the other ends being curved round the perineum and fastened to a solid transverse handle for axis-traction.

The methods of making traction with ordinary forceps and

with axis-traction instruments are well seen in Figs. 136, 137, 138, pages 309, 310, and 311.

If the head be altogether *above* the superior strait, and *movable—i. e.*, not yet fixed in its position by any partial

FIG. 135.



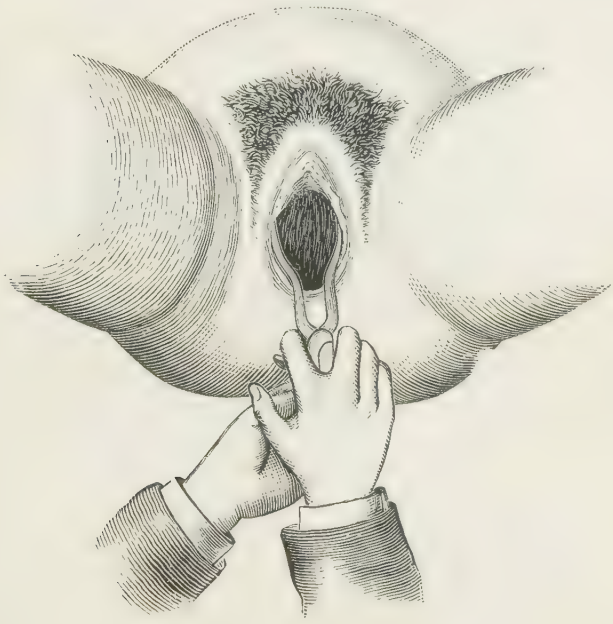
Stephenson's method of axis traction.

engagement at the brim—version should *certainly* be preferred to forceps.

DANGERS OF FORCEPS OPERATION.—Laceration and bruising of the uterus, vagina, and perineum; the vaginal injuries

sometimes involving rectum, bladder, and urethra, thus leading to subsequent ulceration and fistulæ; rupture or injury to veins and subsequent phlebitis; possibly fracture of pelvic bones and separation of pelvic joints when great force is employed. Dangers to the child are: abrasion, contusion, and laceration of the skin; depression or fracture of cranial

FIG. 136.



Traction with Simpson's forceps.

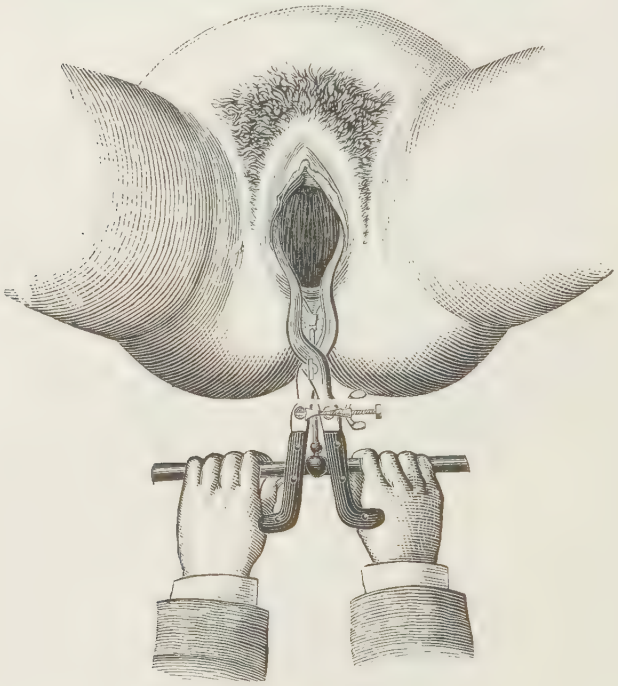
bones; laceration of bloodvessels, and consequent subcutaneous hematocele; temporary facial palsy from injury to facial nerves.

Though no lesion may be apparent externally, the child's brain may have been injured, and idiocy or other form of mental disease result in consequence.

The *prognosis* in forceps cases largely depends upon the conditions preceding and requiring their application, and

upon the care and skill of the operator. It is, of course, more favorable, other things equal, in proportion as the head is low in the pelvis.

Fig. 137.



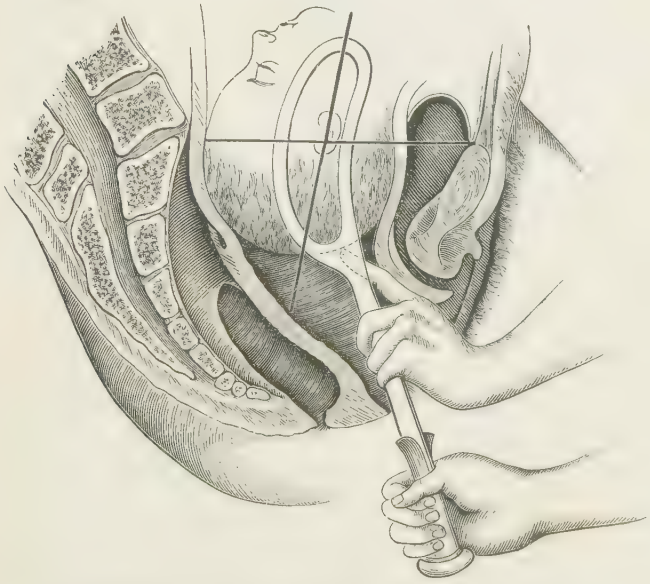
Traction with axis-traction forceps.

Forceps in Face Presentations.—When the face is at the *inferior* strait and the chin has rotated to the pubes the operation is easy and almost identical with that described for head cases with the occiput to pubic symphysis. The blades are applied on each side, and, after traction has brought the tip of the chin well out under the pubic arch, the handles are directed up over the mons veneris, to promote delivery by flexion. Care must be taken to pass the blades *far back* so that their terminal ends fit *round* the occipital end of the

head, instead of *digging into it*, when the handles are compressed. (See Fig. 139, page 312.)

When the chin is toward one of the acetabula at the lower strait the same rules may be applied as for corresponding unrotated anterior positions of the occiput. In face cases, however, the chin is apt to be somewhat *behind* the acetabulum, nearer the centre of the ilium, the face and head more directly

FIG. 138.



Axis-traction with ordinary forceps. Head at superior strait.

transverse in the pelvis, than occurs in vertex presentation. In these the blades cannot well be applied to the *sides of the pelvis*, but should be passed, one along the sacro-iliac junction and the other near the opposite acetabulum, so as to grasp the *sides of the head*, and rotation *must* occur, either spontaneously or by the aid imparted by the blades, *before traction can do any good.*

When the chin has rotated *to the sacrum*, delivery by

forceps is mechanically impossible (see "Mechanism of Face Cases," page 255) if the fœtus and pelvis are of normal size. When the face is at the *superior strait*, or high up in the pelvic cavity, and circumstances *require delivery to be hastened*,

FIG. 139.



Forceps in face presentation at outlet.

version must be preferred to forceps. And when version cannot be accomplished, the only remaining resorts are craniotomy and Cæsarean section.

FORCEPS TO THE AFTER-COMING HEAD IN BREECH CASES.—When the several manipulations already described (see pages 273–276) for delivery in these cases fail, forceps may be tried.

In the more common cases in which occiput has rotated to pubes and forehead to sacrum, the body of the child is lifted up toward the mons veneris, and the blades are applied one

on each side of the head, as before described, the handles being first depresssed toward the perineum, especially when the head is high up, but made to follow the body toward the mons veneris, as the chin, face, and forehead successively emerge over the coccyx. (See Fig. 140.)

When the occiput has rotated to the sacrum, the direction in which the child's body is held during the use of the instrument will depend upon whether the chin is caught *above* or dipping *below* the pubic arch. In the *former* (and rarer) case, the body is lifted toward the pubes, while the forceps are

FIG. 140.



Forceps applied to after-coming head when occiput has rotated to pubes.

passed in to the occiput, which is drawn out *first* along the sacrum to the perineum ("continued extension"), the handles being lifted toward the child's back as the head is born. (See Fig. 108, p. 269.)

In the latter case ("continued flexion") when the chin is *below* the pubes, the body must be depressed toward the perineum, while the blades, having been applied to the sides of the head, the handles (as the chin, face, and forehead come out under the pubic arch) are depressed toward the child's abdomen. (See Fig. 107, page 268.)

The application of forceps when the after-coming head is arrested at the *superior strait*, is a difficult operation, and

manual pressure from above, conjoined with every other means, stated under the "Treatment of Breech Cases" (page 273), should be faithfully tried before attempting their introduction. Their use, however, is to take precedence of craniotomy in any case where this is likely to become necessary, especially if the child be still alive.

CHAPTER XIX.

VERSION OR TURNING.

Version is an operation by which some part of the child other than that originally presenting is brought to the superior strait. When the *head* is brought down, it is "cephalic" version; when the *feet*, "podalic."

When a face or brow presentation is changed by flexion into a head presentation, it is spoken of as "version by the vertex."

The cases in which version may be required are: transverse presentations; sometimes in head, face, and breech presentations; certain cases of moderately contracted pelvis; and in cases where accidental circumstances render rapid delivery necessary, such as placenta prævia, rupture of the uterus, prolapsus of funis, convulsions, tedious labor, etc., provided delivery by forceps is not safe or practicable.

Choice between Cephalic and Podalic Version.—When correction of a malpresentation is *all* that is required, and circumstances do *not* render subsequent immediate delivery necessary, perform cephalic version. When rapid delivery *is* necessary, podalic—bring down feet, that traction may be made and delivery completed at once.

Methods of Operating.—Each of the two operations (1) *cephalic* and (2) *podalic* version, may be performed in three ways: 1. By external abdominal manipulation. 2. By combined external and internal manipulation, the *fingers only*

going into the os uteri. 3. By internal manipulation, the *whole hand* passing into the *uterine cavity.*

Antiseptic Preparation.—Before *any* version operation the abdomen, thighs, and external genitals of the woman, together with the hands and arms of the operator, must be made aseptically clean (as already explained, Chapter XII., page 202); and when the fingers or hand are to enter the uterus, the *vagina* and *cervix uteri* must be *first* thoroughly sterilized with the 2 per cent. creolin solution, or the 1 : 4000 mercuric bichloride solution. When the operation is done, and the third stage of labor completed, the *uterus* and vagina must be washed out with the creolin solution.

Version by External Manipulation.—Chiefly employed for correcting transverse presentations, either before labor begins; or, labor having begun, before the waters have been discharged; or as soon thereafter as possible, while the child is easily movable.

It may also be done in breech cases: changing the breech into a head presentation. The method of changing a face presentation into one of the head by external manipulation has already been described under "Face Presentations."

Operations in Transverse Presentations.—Having previously made out the exact position of the child (head in one iliac fossa, breech in opposite flank), place the woman on her back, with the lower limbs straight out and feet slightly apart, uncover the abdomen, and stand facing the woman, while the hands—one on the child's head, the other on its breech—make *steady, persistent* pressure in a direction to turn the head down toward the brim and the breech up toward the fundus uteri. For example: In the dorso-anterior *position* of a right-shoulder *presentation* (see Fig. 115, page 282), the right hand will grasp the head in the left iliac fossa, and gently press it down toward the pubes, while the left hand laid flat upon the other side of the abdomen, with the finger-ends pointing toward the fundus uteri, will push the breech obliquely *upward* and toward the median line. During a pain stop manipulating, holding the child just firmly enough to retain any degree of change in its position already gained. Pressure in the intervals. When the child slips round into its right position, rupture the membranes (if labor have begun), that the womb

may contract and keep it there. If labor have *not* begun, place two pads—one on the side of the uterus high up against the breech, the other on the opposite side lower down, against the head—and retain them with an abdominal bandage.

In thus bringing the *head* into the pelvis, *cephalic* version is accomplished. Should there be any coexisting necessity for speedy delivery, *podalic* version should be done instead, by pressing the head up into the fundus and the breech down into the pelvic brim.

Operation in Breech Presentations.—The woman having been placed in position as before described, the operator stands on that side of her toward which the child's abdomen is directed; for example, the child's back being toward her right side, he stands on her left. His right hand is placed on the fundus uteri and the head pressed laterally and down toward the left iliac fossa, while the left hand, placed transversely above the pubes (finger-ends pointing to her right), push the breech laterally toward the right iliac fossa. The child's body having been thus made to *begin* the desired change, the pressure is continued, right hand pressing head down into the pelvic inlet, left one pushing breech upward into fundus uteri. Should the beginning of the change be difficult to accomplish, owing to the breech dipping a little into the pelvic brim, one or two fingers may be passed into the vagina, and the breech lifted above the brim, while the other hand makes pressure on the head externally. As a rule, the pressure upon the breech will be more efficient than that upon the head. The operation is easier in multiparæ than in primiparæ. After several successive failures to turn the child, the operation should be abandoned.

Operation in Head Presentations.—Changing a head presentation into a breech, by external manipulation, comprises the same methods (reversed) as those just described for changing the breech into a head presentation.

Version by Combined Manipulation.—When version by external manipulation is necessarily impossible, or has failed after trial, the second least dangerous method, by combined manipulation, should be tried. This consists of manipulating outside with *one* hand, while the other is passed into

the *vagina*, two or three of its *fingers only* going into the *uterus*. The hand outside pushes down the part it is desired to bring to the superior strait, while the fingers inside simultaneously move the part at the os out of the way and upward along the opposite side of the pelvis. Thus, in *head presentations*, when it is desired to bring down the feet, the operation comprises three steps:

FIG. 141.



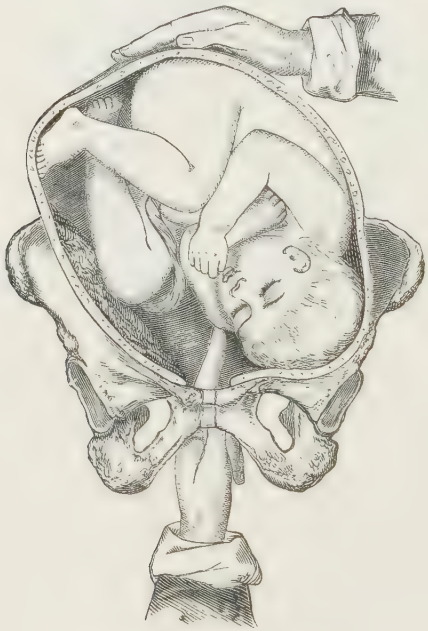
Bipolar version (first step).

Operation of Bipolar Version in Head Presentations.—1. The fingers inside lift the head toward that iliac fossa toward which the occiput points, while the hand outside depresses the

breech along the opposite side of the womb (Fig. 141). This having been done—

2. The fingers inside can now touch the shoulder, and they push or lift it in the same direction as the head, while the hand outside still further depresses the breech (Fig. 142). The head is now a little higher above the brim than the breech, and the knee is within reach of the fingers.

Fig. 142.



Bipolar version (second step).

3. Grasp the knee (the membranes, if unbroken, may be ruptured) and pull it down, while the hand outside *changes its position* so as to *push up the head* toward the fundus (Fig. 143). The foot may now be reached and the case managed as a breech or footling presentation.

In *transverse presentations* the operation comprises the second and third steps above given for head cases—that is, push the

shoulder after the head, then grasp the knee, etc. Should it be desired, however, to convert the shoulder (transverse) presentation into a *head* presentation instead of a footling, the fingers inside will, of course, push the shoulder in the direc-

FIG. 143.



Bipolar version (third step). The external hand, as shown in the figure, has not yet changed its position, but is ready to do so.

tion of, and *after the breech*, while the hand outside *depresses the head* toward the pelvic brim.

BIPOLAR VERSION IN FACE PRESENTATION.—Operation is essentially the same as previously decribed for head presentation. The fingers inside, during the first step, push the face toward that side of the pelvis opposite the chin—*i. e.*, they lift it on to that iliac fossa toward which the *forehead* is directed.

It should be particularly observed that the *main purpose* of

this combined or "bipolar" method is to supersede the more dangerous proceeding of introducing the whole hand and part of the forearm into the uterus, which is the only mode of version remaining when the external and bipolar methods have been unsuccessful. The bipolar method can be done before the os uteri is sufficiently dilated to admit the whole hand.

Version by Internal Manipulation.—Like all the version operations, this is comparatively easy before the waters have escaped and when the uterus is not rigidly contracted round the child, but difficult when opposite conditions prevail. Additional conditions, however, are necessary before the operation should be attempted, viz.: the pelvis must be of sufficient size to admit the hand; the os uteri must be dilated or dilatable; the head (if it present) must not have passed through the os uteri, and the presenting part (whatever it may be) must not have descended so low or become so firmly impacted in the pelvis that it cannot be pushed back above the superior strait without risk of lacerating the utero-vaginal junction or other soft parts.

Internal Version in Head Presentations.—The operation comprises three steps:

1. Introduce the hand and grasp the feet.
2. Turn the child
3. Extract the child.

The first *two* steps are to be proceeded with only *between* the pains; the *third* step, only *during* the pains. When a pain comes on during the first two parts of the operation hold the hand still, relaxed, and flat, and thus avoid risk of rupturing uterine walls with the knuckles.

Operation.—The woman is placed on her back, the hips brought to the edge of the bed, the legs properly supported; the operator *sits* between them on a low seat. If the womb be firmly contracted and waters discharged, *complete* anæsthesia is required.

Bare the arm to above the elbow, and anoint it with carbolized vaseline on all parts except the hand's palm. Use the hand whose palm corresponds to the abdomen of the child, viz., in the L. O. A. and L. O. P. positions, the left hand; in the R. O. A. and R. O. P. positions, the right hand.

The finger-ends are brought to a cone over the end of the

thumb, and the hand introduced into the vagina (with a slight rotatory movement, if necessary) in the axis of the pelvic outlet, its back toward the sacrum. The finger-ends and hand are then pressed on into the os uteri, the elbow being depressed toward the perineum so as to bring the hand in line with the axis of the brim, while the other hand rests outside, making support and counter-pressure upon the fundus.

FIG. 144.



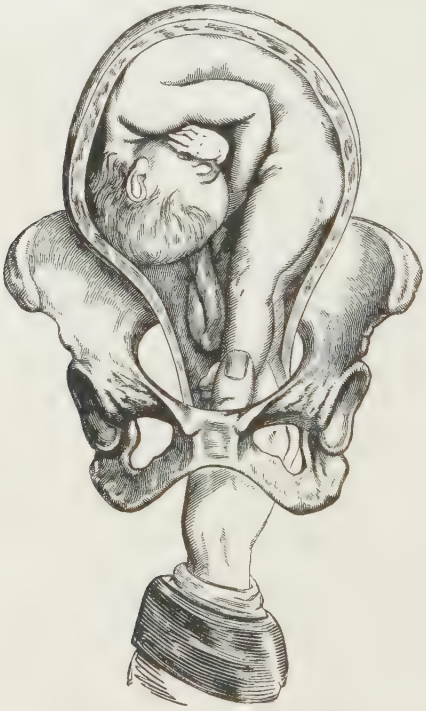
Podalic version: grasping the feet.

With the thumb between the head and pubes, and the four fingers between the head and sacrum, the head is grasped and lifted out of the way, "on the shelf" of that iliac fossa toward which the occiput points. The wrist resting against the forehead keeps it there, while the hand goes on up to grasp

the feet, the other hand continuously supporting the fundus (see Fig. 144).

The feet (one, or both if possible) are then drawn down, while the other hand depresses the breech, which begins the *second* step, or *turning* the child (see Fig. 145). As it gets

FIG. 145.



Podalic version : turning the child.

partly round, the hand outside may change its position to push up the head. The latter having reached the fundus, turning is accomplished, and (3d) *extraction* (*during* the pains) may be completed, following the mechanism and mode of delivery already described for breech cases.

Should the membranes be unbroken at the beginning of the

operation they should be ruptured when the hand passes by the head into the uterus, the wrist acting as a plug in the os to prevent escape of waters; or the hand may be passed up *between* the unbroken membranes and uterine wall, the bag being ruptured when the feet are felt. The latter method is objectionable, from risk of loosening placenta, unless the operator be skilful.

VERSION BY INTERNAL MANIPULATION IN TRANSVERSE PRESENTATIONS.—This proceeding comprises the same three steps as just described for head cases, and the same general rules of operating, with modifications now to be noted. In selecting the hand (the woman lying upon her back), use the right hand when the right side (shoulder, etc.) presents, and the left for the left side.

WHERE TO FIND THE FEET.—In the *right* shoulder or arm "presentation," when the "position" is dorso-*anterior* (*left* cephalo-iliac), it is evident the feet will be found toward the *right* and *posterior* part of the womb, above the *right sacro-iliac synchondrosis*, hence easily reached by passing the right hand along the hollow of the sacrum, to the *right* of its promontory, and then higher, toward the posterior part of the *right* iliac fossa.

In the *left* shoulder or arm presentation, when the position is dorso-*anterior* (right cephalo-iliac), it is evident the feet will be toward and above the *left* sacro-iliac synchondrosis, hence easily reached by passing the left hand on the left side of sacral promontory, etc.

These dorso-*anterior* positions are *far* more frequent than dorso-*posterior* ones.

In the dorso-*posterior* (*right* cephalo-iliac) "position" of a right shoulder or arm "presentation," the feet will rest toward the *left* and anterior part of the uterus above the *left* acetabulum. The right hand, therefore, should be passed along the sacrum as before, but to the *left* side of its promontory, and then higher up toward the posterior part of the *left* iliac fossa (where it feels the back of the child's breech), and must then be *pronated round the breech*, over the thighs, toward the anterior part of the *left* iliac fossa, where the feet will be found.

In dorso-*posterior* (*left* cephalo-iliac) position of a *left*

shoulder presentation the feet will rest toward the *right* anterior part of the uterus above the *right* acetabulum, and will be reached by the *left* hand going behind and pronating round the breech as before described.

There is another mode of reaching the feet in the two *dorso-posterior* positions, viz., by passing the hand directly up to the feet behind the pubes and acetabulum, instead of going behind the child's breech and pronating round it. This method is made easier by placing the woman on her *side* (the side toward which the feet are directed), while the operator, standing behind her, passes the hand (right one for right lateral "presentation," and left one for left, as before stated), with its *back* toward the *pubes* and acetabulum, directly to the feet.

Which foot to pull down.—From the infrequency of transverse presentations, only comparatively few operators have a sufficient number of cases to formulate rules based on their own experience, and those who *have* do not agree; some prefer one foot, some the other, and find theoretical reasons for their choice. No fixed rules can be stated; much depends on the conditions present in each case—whether difficult or easy, whether early or late, whether with or without some pressing emergency for haste—and a great deal depends upon the acquired skill of the operator.

It is perhaps best to get *both* feet if this can readily be done; if not, get one, and in difficult cases with previous delay, discharge of the liquor amnii, rigid uterine contraction, dangers from hemorrhage, impending rupture, or some other pressing emergency it is perhaps better to *get the first one you can find*, and thus avoid risks of delay and prolonged manipulation in making a selection. In easy, early cases, either foot will do; but a skilled operator would prefer to seize the one diagonally opposite the presenting arm or shoulder—*i. e.*, if the right arm present, seize the left foot, and *vice versa:* this makes turning easier.

In transverse presentations, when the child has been *turned*, the case may be left to nature, unless circumstances render rapid delivery necessary, when the *third* step of *extraction* may be performed. If it is to be left alone, only *one* foot should be brought down, so that the buttock of the other side may add to the size of the breech and produce adequate dilatation of the os, so as to permit easy passage of the after-coming head.

Cephalic version by *internal* manipulation is not performed nowadays, owing to the difficulty of grasping the globular head and for other reasons, though it was preferred to podalic in former times.

Prolapse of the Arm.—A tape may be put upon the arm by which an assistant holds it extended in the vagina, while the operator's hand passes in to perform *internal* version; but it must not be held by the tape so tightly as to interfere with its upward recession when the feet are being drawn down. Traction on the tape may also be used to deliver the arm and prevent its ascending alongside of the head during extraction of the body. In performing *bipolar* version the arm may sometimes be used to advantage in *pushing the shoulder* in the direction of the head, as before explained.

Difficulties of Version.—The external and combined methods of version, when they can be accomplished at all, are done with comparative ease, and only in the more favorable cases. They would scarcely be attempted and seldom succeed in the more difficult cases now to be considered, and in which even internal version is anything but easy.

The most common difficulty is evacuation of the waters and *rigid contraction of the uterus* around the child. The manipulations increase uterine spasm still more; the operator's arm becomes cramped and useless from pressure; the child will not turn; and there is great risk of uterine rupture if violence be employed. *Treatment: Complete* anæsthesia to relax the womb, and steady, gentle, persevering efforts on the part of the operator. Should the operator's hand become numbed and useless, it must be withdrawn for recuperation, and reintroduced afterward, or in its place, the hand of a skilled assistant may be resorted to.

Even when the foot has been drawn down to the os uteri, the shoulder (or head, as the case may be) will not recede, and turning seems impossible. *Treatment:* Fasten a tape to the foot, of sufficient length to be held outside the vulva, on which traction may be made by an assistant, while the hand inside pushes the head (or shoulder) in the proper direction. In shoulder cases further assistance may be rendered by *external* upward pressure of the head. The internal repres-

sion must be made with *extreme caution*, to avoid laceration, etc. By grasping the arm near the elbow, the shaft of the humerus may be used to make upward pressure in the glenoid cavity of the shoulder. When the presenting part, whatever it may be, will not recede sufficient to admit the obstetrician's hand, placing the woman in a *genu-pectoral* posture will be serviceable. No case should be considered impossible until this posture has been tried. Again, by placing the woman in a squatting posture (provided there be no contra-indication to it, as might occur from great exhaustion, etc.), the pressure of her own thighs upon the abdomen may lift both womb and child, and thus secure the desired recession of the presenting part. Should all efforts fail, embryotomy becomes the only resort; or, if the child be alive and mother in good condition for the operation, symphyseotomy may be done.

After turning, *extraction* may be difficult. Traction on the lower extremities should be made slowly when the soft parts are not yet dilated. It is unnecessary to attempt to aid rotation of the hips—the leg that is down will spontaneously come to the pubes. When hips begin to emerge elevate leg, or legs, toward pubes, that the posterior hip may escape first at the perineum. In grasping the child's body after delivery of the breech, grasp *its pelvis*, not the soft structures above, which might injure the viscera of the abdomen. The hips and the abdomen having been delivered, the arms come next.

Extraction of the Arms.—Delay with the arms (as with the after-coming head) is fatal to the child—often within ten or fifteen minutes; hence different methods of extracting arm should, if necessary, be tried in rapid succession.

Arms Flexed.—Normally, arms *remain flexed* on chest, the elbows pointing down toward the breech. Here delivery is usually easy, thus: rotate body of child to bring one shoulder to pubes, the other to sacrum; pass in the hand whose palm corresponds to the child's abdomen up to the chest, seize the forearm, as near the wrist as possible, and pull it down, the delivered portion of the child's body being meanwhile lifted up and toward its back, thus giving more space for the operator's hand over the abdomen. Posterior arm to be delivered first.

Arms Extended.—In version cases when traction is made on breech, arms get displaced; they catch against sides of pelvis and become extended, and point straight up alongside

of the head. *Often very difficult to deliver. Treatment:* With one hand lift the legs and body, as far as possible, upward over the pubes, and to one side; this will aid the posterior shoulder to descend and give room for the *whole hand* of the operator to pass into the vagina along the *back* or *side* of the child, until two fingers reach the posterior shoulder, and then slide along the arm to the *elbow*, which is pushed across the

FIG. 146.



Delivery of posterior arm when extended.

child's face and brought down over its chest. If the fingers cannot reach the *elbow*, place one of them lengthwise, on each side of the arm (where they act as splints to prevent fracture) and push humerus across face and chest, as before. (Fig. 146.)

If this effort to deliver with the hand passing in along the *back* or *side* of child fail, withdraw the hand without delay, lift the child's body toward the opposite side (but still upward

over pubes) and pass hand in along *abdomen* of child, until two fingers reach elbow and hook it forward over face and chest, as before stated. If time allow any choice, the hand should be passed in between the pains.

The *posterior* arm having been delivered, the other—directed *anteriorly* toward the pubes—must be extracted,

FIG. 147.



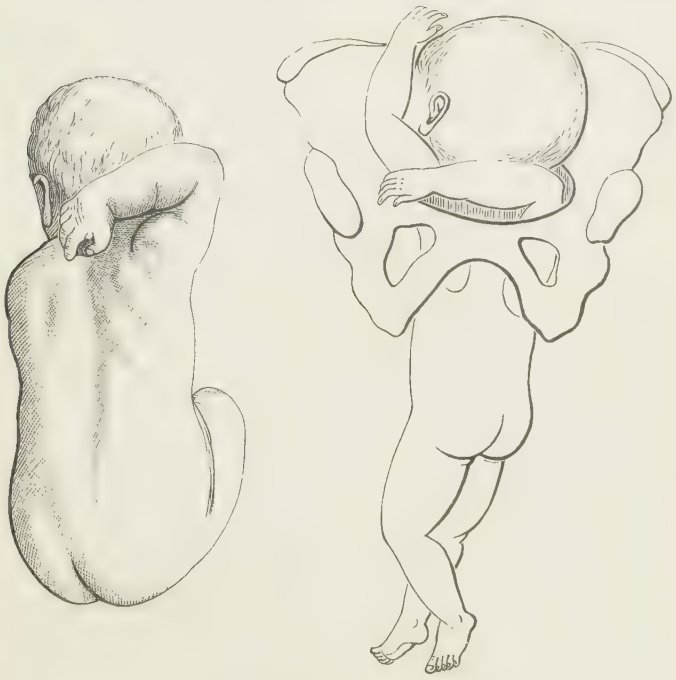
Delivery of anterior arm when extended.

thus: In some cases depress child's body, as far as possible, toward perineum and to one side, while the operator's hand passes in, either along *back* or *abdomen* (try both if one fail) until reaching *elbow*, which is drawn by two fingers across face and chest and brought out under pubes. (Fig. 147.)

Another plan: Instead of trying to extract anterior arm

under pubes, or having failed after trial, rotate undelivered arm to sacrum, where there is more room, and deliver as if it had been originally posterior. This rotation is accomplished by seizing released arm and drawing it up along one side of the pelvis, from the sacrum to the pubes: the shoulder inside follows the movement and goes to the sacrum, when it is delivered in the same way, but more easily, than the first one.

FIG. 148. FIG. 149.



Dorsal displacement of the arm.

Shoulders Transverse.—Instead of rotating into antero-posterior diameter, shoulders sometimes remain transverse. *Treatment:* Grasp thorax in both hands and rotate one shoulder to front, one to rear. Failing in this, if back be toward pubes, lift body upward and pass hand along abdomen,

to seize elbow, and bring it down across face, etc. If back of child be *toward sacrum*, the arms, if *flexed*, may be drawn out under pubes; if *extended*, this will be difficult or impossible. Try, then, to pass hand back of child and draw elbow *backward* and *downward* along and below side wall of pelvis, then *push* forearm over thorax and draw it down.

Dorsal Displacement of the Arm, as shown in Figs. 148 and 149, may occasionally complicate extraction. This may occur in *two ways:* The arm having been *extended* alongside of head, the elbow becomes bent, throwing forearm behind neck, below occiput, where it catches upon brim of pelvis and arrests progress. It is caused by rotating the child's body, the arm failing to follow this rotation, and is *treated* by rotating the child's body in the opposite direction to the rotation that produced the displacement.

It may also occur from the same cause when the arms remain *flexed* across the chest, and is *then* relieved by passing in the hand along the back of the child and grasping the elbow, which is pulled *downward* and *forward;* or simply hook *a finger* in the bend of the elbow and push or sweep it laterally and forward over the child's face. In the case shown in Fig. 148 the finger would thus sweep the elbow and forearm toward and over the *right* ear and side of the head, until it got them in front, over the face and chest. When it occurs with the arm *flexed*, the scapula will be found *near* the spinal column; when occurring with *extension*, the scapula will be forced *away* from spine; hence diagnosis of methods to be used.

In version cases, after extraction of the shoulders, the after-coming head is to be delivered by the methods already described under breech presentation (pages 273–278).

CHAPTER XX.

CUTTING OPERATIONS ON THE MOTHER.

The cutting operations on the mother are: Symphyseotomy; Cæsarean Section; Porro's Operation; the Porro-Müller Operation; Cœliotomy;[1] Cœlio-elytrotomy.[1]

Symphyseotomy (Sigaultian operation).—An operation invented by Sigault for enlarging the pelvis, by dividing the symphysis pubis and separating the pubic bones from each other. It was first practised on the living woman by Sigault in 1777. Since that time the operation has been regarded at different periods with alternating favor and opposition in European countries, but was never performed in the United States until 1892. In September of that year attention was called anew to the good results obtained by improved methods of doing the operation under antisepsis by Dr. Robert P. Harris, of Philadelphia, and subsequently the utility of the proceeding has been practically demonstrated in this and other countries, and is now generally recognized.

When the symphysis is divided during labor the pubic bones spontaneously separate from each other to the extent of an inch or more; they open like a pair of folding doors, of which the sacro-iliac synchondroses represent the hinges; by separating the woman's lower limbs the gap may be increased to two, two and a half, or even three inches, but so wide a separation as three inches is not usually advisable or necessary. Should either of the sacro-iliac joints (hinges) be anchylosed, and consequently immovable, the operation cannot be done successfully, and is contra-indicated. The child is delivered—usually by forceps or version—immediately after division of the pubic joint. Less frequently the natural powers are sufficient to accomplish delivery.

After division of the symphysis the pubic bones not only separate *laterally*, but the two halves of the now divided

[1] The term Cœliotomy (from *Koilia*, the abdomen) has been lately substituted for Laparotomy (from *Lapara*, the flank or hollow of the waist). Common usage still accords a similar meaning to both terms. Cœliotomy is the more correct.

pelvis (more exactly the two innominate bones), owing to the peculiar structure of the sacro-iliac synchondroses, have also an *anterior dip*—they go down a little in front, toward the perineum—thus moving the anterior wall of the pelvis farther from the sacral promontory: the line of the conjugate diameter of the brim becomes more slanting—more like the "diagonal" conjugate—and is thereby lengthened. This descent in the anterior part of the innominate bones is farther increased by pressure of the head during labor.

Cases Suitable for the Operation.—(1) *Contracted pelves*, in which the true conjugate diameter measures between two and three quarters and three and one-quarter inches (7 to 8.2 cm.) —the pregnancy having, of course, reached full term. By separation of pubic bones the conjugate is lengthened *about* half an inch, while a further gain of *about* one-fourth of an inch is acquired by the presenting part protruding into the gap between the divided bones. In "*flattened*" pelves, in which the transverse diameter is relatively wide, the lower figure—two and three-quarter inches—may, after symphyseotomy, admit a living child to pass. In "*generally contracted*" pelves the higher figure—three and one-quarter inches—will be more necessary. In both kinds of pelves symphyseotomy produces also enlargement of the transverse and oblique diameters. In fact, these two diameters are lengthened *more* than the conjugate; thus, when the pubic bones separate two and three-quarter inches, the conjugate will be increased half an inch, the oblique one and one-third inches, and the transverse one and one-fifth inches or thereabouts.

(2) Cases in which the child is *unusually large*, or in which it has become *impacted* from faulty mechanism, as in *arrested mento-posterior* positions of face cases, and *occipito-posterior* positions of head presentations. Also arrested cases of breech or shoulder presentations when usual methods of delivery fail.

(3) It is evident that conditions mentioned under headings (1) and (2) may coexist and still be suitable for the operation, but with less prospect of success in some instances.

In order that the operation shall succeed certain other conditions should be present in every case, viz.:

(*a*) The os uteri must be *sufficiently dilated* to allow rapid delivery after symphysis is divided; or *sufficiently dilatable* to allow rapid dilatation artificially.

(*b*) The child must be, not merely *alive*, but so far *un*injured by delay, or by previous attempts to deliver, as to give it every chance to survive after birth.

(*c*) The *mother* should be in *good condition:* neither exhausted by delay and exertion, nor injured locally by fruitless attempts to deliver by other methods. She must be free from septic infection.

The operation is *contra-indicated* when there is anchylosis of either sacro-iliac joint (hence in the oblique pelvic deformity of Naegelé, and Roberts' pelvis); in all cases when the conjugate is *less* than $2\frac{3}{4}$ inches—presuming the child to be full-sized; in cases of bony, cancerous, fibroid, or other tumors occupying the pelvic canal, etc. Anchylosis of the pubic joint itself does *not* necessarily contra-indicate the operation—a chain-saw being in readiness to cope with this difficulty.

Dangers of the Operation.—Hemorrhage from the wound; laceration or other traumatism of bladder, urethra, and vagina, and subsequent fistulæ; impaired locomotion from faulty union of pubic bones and injury to sacro-iliac synchondroses; septic infection of wound. All of these have occurred; but improved methods of operating are gradually reducing the frequency of their occurrence. While the maternal mortality during the last few years has been about 12 per cent., more recent results, owing to improved *technique* and making the operation an "elective" one instead of a last resort, show a diminished mortality and indicate that in future the death-rate may be reduced to *nothing* under favorable circumstances The *infant mortality* is not increased by, but largely depends upon the conditions preceding, the operation.

Instruments, assistants, etc. One assistant to give the anæsthetic; one to hold a catheter in the urethra, and otherwise aid the operator; a nurse to take charge of the child; another assistant may be advisable to secure uterine contraction and retraction, and delivery of placenta.

The *instruments* necessary are: a scalpel; a probe-pointed bistoury (the latter in place of Galbiati's or Morisani's knife); a dissecting forceps; half a dozen artery forceps; needle-holder and curved needles; a metal female catheter; a chain-saw; sutures of silk or silkworm-gut; iodoform gauze; ligatures; strips of adhesive plaster two or three inches wide, long enough to go round the pelvis; a strong binder or abdominal bandage of inelastic material; together with iodo-

form and the usual materials for antiseptic dressing, and a pair of obstetric forceps.

Operation.—The method of operating is still undergoing revision: necessary modifications and improvements in its *technique* have been added during the last few years. The pubes, labia, and perineum are shaved, and, together with the abdomen, thoroughly disinfected by soap and water, bichloride solution, ether, etc., as in any abdominal section. The vagina also is thoroughly sterilized with a bichloride solution 1 : 2000. The woman is anæsthetized and placed on her back near the edge of the bed. Some operators stand by her side; others prefer to be in front between her lower limbs.

The bowels must, of course, have been previously emptied, and the bladder catheterized immediately before commencing the operation, when it will also be advisable, by a final auscultation, to ascertain *positively* that the child is still alive.

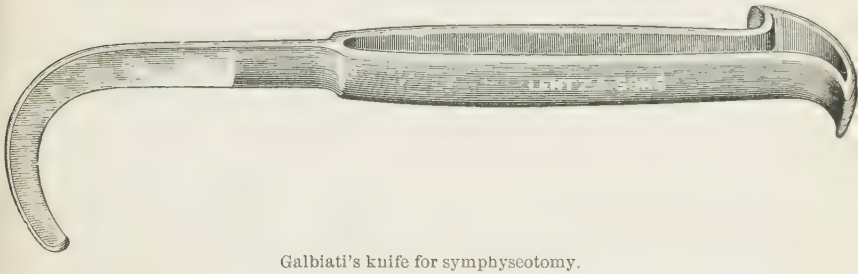
There are *two ways* of doing the operation: *first*, the "*closed*" or "*subcutaneous*" method, with a *short* incision; *second*, the "*open*" method with a *long* incision. Each has its advantages and disadvantages: some operators prefer one, some the other. The *closed* method with *short* incision is generally preferred; as will presently be seen, it entails less danger of septic infection of the wound from the lochia, and less risk of hemorrhage.

Subcutaneous method, with short incision.—In the median line of the abdomen, an incision is made one and one-half inches long (some make it *one*, others *two* inches), the *lower* end of which is half an inch *above* the upper end of the pubic symphysis. Cut through skin and fascia, down to the recti muscles. The attachments of these muscles are separated from the posterior surface of the symphysis and pubic rami, with the finger, which is passed down behind the joint until it can be hooked under the pubic arch. The assistant now passes a metal catheter into the bladder and holds the urethra backward and toward the right side, to keep it out of the way while the joint is being divided.

The sickle-shaped knife of Galbiati (Fig. 150), or what is just as good (or better in some cases) a probe-pointed, slightly curved bistoury, is passed down, guided by the finger, behind the articulation and hooked under the subpubic ligament, when the cartilaginous and ligamentous tissues of the joint are cut from behind forward and from below upward, until

the bones separate—sometimes with an audible crack. The joint is not *obliged* to be severed in this particular manner. The point of the bistoury may be guided by a Hay's director (previously introduced) instead of the finger; or, again, the bistoury *alone,* its point kept closely in contact with the articulation, may be passed down, guided by a finger of the other hand in the vagina. Again, the joint *may* be severed from above downward and from before backward, a lead plate, or a tampon of iodoform gauze having been first placed behind the joint, to prevent injury of the retro-pubic tissues.

FIG. 150.



Galbiati's knife for symphyseotomy.

Note that the *subpubic ligament,* as well as the interarticular cartilage, must be divided, or the bones will not separate satisfactorily. There *is* a plan, however (devised by Dr. Harris, of Chicago) in which the subpubic ligament is intentionally left *un*-cut: instead of cutting it in the middle he separates its central and lateral attachments to the pubic arch (together with those of the perineal fascia) with a blunt-pointed bistoury, closely "hugging" the bone, under guidance of the finger. Numerous advantages are claimed for this method.

The joint having been divided, the wound is packed with iodoform gauze and covered with a compress wet with bichloride solution, while the child is delivered, either by labor pains alone, should they be strong enough; or by forceps, if the head have already engaged in the pelvic brim; or by version, if it be yet *above* the brim. The child having been delivered is handed to an assistant, or trained nurse, who should have previously prepared bowls of hot and cold water, etc., to secure its resuscitation, should this be re-

quired. The placenta is delivered by expression in the usual manner. During delivery of the child, pressure on the trochanters must be made by assistants to prevent too wide separation of pubic bones.

Open method of operating with long incision.—An incision is made in the median line three or four inches long, beginning half an inch or an inch above the upper end of the symphysis, and ending at the root of the clitoris, or a little on one side of it.

These tissues are cut down to the joint, and the incision then continued through the cartilage of the joint itself, the symphysis being thus severed from before backward and from above downward. The precautions to prevent accidental injury of the urethra, bladder, etc., are the same as when operating by the subcutaneous method, by short incision.

Delivery of child and placenta accomplished, the iodoform gauze tampon and sublimate compress are removed. The wound is cleansed with bichloride solution, hemorrhage arrested, and the incision closed by sutures. It is *not* necessary to suture the bones or cartilages. A catheter is used, as before, to keep the bladder, urethra, or vagina from being nipped and pinched between the two pubic bones while the latter are being continuously held in apposition by assistants making pressure upon the trochanters while sutures are being passed. The sutures—of silk or silkworm-gut—may advantageously pass through the fibrous tissues on the anterior aspect of the pubic joint. In very fat women a separate running catgut suture may be used to unite the recti muscles, before the superficial ones are put in. Antiseptic dressing is applied to the wound, and kept in place by adhesive strips; while over this is placed a strip of strong rubber adhesive plaster, three or four inches wide, going over the trochanters and completely round the pelvis, to keep the bones immovably in apposition. Lateral pressure by the assistants must be unremittingly continued until immobility of the bones is secured by the completion of the dressings just described. The rubber adhesive plaster may be reinforced by additional support of an ordinary muslin bandage. All sorts of devices—canvas belts with straps and buckles, Esmarch bandages of solid rubber, a wire cuirass, padded plates, special beds, sand-bags etc.—have been used to secure immobility of the bones, but the strip of rubber plaster is always available, and its efficiency has been demonstrated by numerous operators.

An antiseptic absorbent pad, or a complete "*occlusion dressing*" (see page 220) should be applied to the vulva, and, as a further security against sepsis, the vagina may receive a tampon of iodoform gauze, or instead of this an ounce of antiseptic powder (1 part iodoform to 8 of boric acid) may be deposited in the vagina and left there.

The woman must remain on her back for a week, her lower limbs being stretched out straight and the knees lightly tied together. During second week she may turn on her side. After three weeks she may sit up. The pelvic bandage should be worn for six weeks.

The dressing upon the wound may remain untouched for five days, there being no indication of suppuration and no soiling from the lochia. The bowels and bladder must be attended to as usual, a catheter being used for the latter if required. The rest of the after-treatment is the same as that for ordinary labor cases, *plus* the abdominal wound, which is cared for according to surgical rule.

A *third* method of operating, devised by Dr. Edward A. Ayers, of New York, has been recently practised with success, and promises well. In contra-distinction to the "subcutaneous" method, it might be called "submucous," for *no* wound is made in the *skin*. It is as follows:

Ayers' Operation.—The vulva, vagina, etc., having been made aseptically clean, the patient, on her back, is brought to the edge of the bed and the thighs flexed. The bladder and urethra are drawn to the left by a urethral sound, while clitoris and labia minora are drawn upward and to the left. The operator's left index finger now enters vagina and passes up along posterior groove of symphysis until reaching the *top* of the joint. A small incision, beginning half an inch below the clitoris, only long enough to admit easily the blade of a bistoury, is made over and down to the articulation. A blunt-pointed bistoury is then pushed up along the anterior face of the symphysis, *under* the vessels of the clitoris, until the point of the instrument can be felt over the *top* of the joint by the tip of the finger in the vagina. Guarded by this finger, the blade of the bistoury is now worked down through the articulation, cutting from top to bottom. To sever the subpubic ligament the direction of the bistoury may be changed, so as to cut from below upward. The finger in the vagina easily determines when the bones separate and the

distance between them. Delivery, etc., as in the other methods.

The little wound is packed lightly with iodoform gauze (to be removed in thirty-six hours); covered with a gauze dressing (no suturing required); while vagina and vulva are kept clean by bichloride irrigation. Catheterism (the wound being above the meatus urinarius) may be done, if necessary, without infection.

Difficulties during Operation.—Hemorrhage from the wound may be controlled by ligature if possible — especially if arterial; venous oozing, by a tampon of iodoform gauze stuffed in the wound, with counter-pressure by the fingers in the vagina.

There may be difficulty in finding the joint; it is not always centrally placed, nor always straight. By moving one lower limb of the woman while the operator's finger is in position, the motion of one side will thus reveal the situation of the symphysis.

In case the joint be anchylosed, a chain-saw may be passed down behind and up in front of the articulation, and the junction sawed in twain.

Accidental incision or laceration of the urethra or bladder should be sutured with fine silk. If the wounds fail to unite, a secondary operation may be needed after the puerperal period is over.

The presenting head of the child may be jammed so closely against the pubic bones as to interfere with the operation. The presenting part should be pushed up out of the way, and, if space cannot then be obtained for the bistoury to cut from the back of the symphysis forward, the incision must be made from before backward.

Finally, be it remembered, that whatever the method of operating, symphyseotomy is done for the most part in the interest of the *child*, and is designed, chiefly, to supplant craniotomy and other methods of forcible delivery by which the life of the infant is jeopardized and sometimes lost.

The utility of combining symphyseotomy with the induction of premature labor in cases of contracted pelvis has not yet been positively demonstrated.

In certain cases, when the *child is dead*, symphyseotomy combined with embryotomy may be resorted to, in the *interest of the mother*. In practice these cases have not yet been

definitely settled. Theoretically, when the pelvis is so much contracted that the danger to the mother of a difficult craniotomy *alone* is so far reduced by symphyseotomy that the reduction is greater than the additional risk incurred by the latter operation; or, again, should it be possible to obviate the greater danger of abdominal section by combining embryotomy with symphyseotomy, the latter operation would seem to be indicated. These are matters for future decision.

Cæsarean Section (*formerly Gastro-hysterotomy; later Laparo-hysterotomy; more recently Celio-hysterotomy*).—An operation which consists in cutting through the walls of the abdomen and uterus, and delivering the child and placenta through the incision. The cases in which it is performed are: (1) *extreme* deformity of the pelvis, in which delivery by craniotomy is either impossible, or would be more dangerous to the mother than cutting into the uterus and abdomen; (2) cases of more moderate pelvic contraction, in which craniotomy is possible, but Cæsarean section is agreed upon to *save the life of the child;* (3) mechanical obstruction in the pelvis from fibroid, cancerous, bony, or other tumors which cannot be pushed out of the way or safely removed; (4) irreducible impaction of a *living* child in transverse presentations; (5) in women dying near the end of pregnancy, the child, if alive, is rapidly delivered by post-mortem Cæsarean section; (6) various other exceptional conditions resulting from inflammatory changes, constrictions, uterine displacements, etc., may, rarely, require the operation.

Before deciding upon a Cæsarean operation it should be determined that the case is not suitable for delivery by symphyseotomy.

Prognosis and Danger.—Death may result (1) from *hemorrhage* during or after the operation; (2) from *shock*, especially in women greatly exhausted; (3) from *peritonitis* and *metritis;* (4) from *septicæmia*. The percentage of maternal recoveries, as deduced from statistics, is notably unreliable. The figures usually include *all* cases: alike those who die *after* the operation, and those who die *on account of it*. The result depends more on the conditions preceding, attending, and following the operation, than upon the operation itself. Not long ago the results of so-called "*cattle-horn Cæsarean section*" (cases in which pregnant women were torn open by the horns of

infuriated animals) were more favorable than cases operated upon by surgeons, for the reason that the cattle were goring healthy women, while the surgeon was operating on women exhausted by long labor and with tissues injured by unsuccessful attempts to deliver by forceps, version, etc. While the mortality *used to be* 50 per cent. or more, it has of late been so far reduced by improved methods and knowledge, that by "a recent analysis of the literature of the world, conducted with the idea of determining the prognosis of this operation under favorable conditions, it was discovered that up to August, 1888, thirty-nine Cæsarean sections had been performed by thirty operators," with the result that *all* the mothers recovered and thirty-eight children were saved;[1] and this, even though most of the operators were doing the operation for the first time.

Later statistics (1894) give the following results: "Of thirteen cases where the operation was performed before labor had begun, ten women recovered and thirteen children were saved; of six cases where the operation was performed at the beginning of labor, six women recovered and six children were saved; of twelve cases where the women had been in labor from two to six hours, ten recovered and eleven children were saved; of eighteen cases where the women had been in labor from seven to twelve hours, eight recovered and thirteen children were saved."[2]

The *best* results are obtained by making the operation a so-called "*elective*" one—that is to say, the obstetrician (having previously ascertained the advisability of the operation) *elects* a favorable time, place, etc., for its performance, instead of doing it by compulsion under adverse circumstances, when other methods of delivery have failed; which simply means, do it near the end of pregnancy *before labor begins*; elect the time and place; secure assistants, nurses, instruments, dressings, and prepare the patient by previous treatment, etc. These things *cannot* so well be done during the sudden emergency of labor, especially at night.

Since surrounding circumstances and existing conditions so far vary that no two sets of cases are exactly alike, statis-

[1] Edward Reynolds: Practical Midwifery, page 197.
[2] Grandin and Jarman: Obstetric Surgery (quoting Dr. Robert P. Harris), 1894, page 145.

tical results must vary also, and figures can therefore give only approximate indications for future guidance.

Unfavorable conditions, such as the atmospheric impurities of hospitals; previous exhaustion (both of woman and womb) from protracted labor, or coexisting disease; previous injury from unsuccessful attempts to deliver by version, forceps, etc.; bungling from lack of skill during the operation; neglect of antiseptic precautions; and injudicious after-treatment, have largely increased the death-rate. To be successful, the operation should not be put off as a last resort, but performed early, the conditions requiring it having been made out, if practicable, at or before the beginning of labor.

Operation, preparation for.—If practicable, let the patient avoid solid food for twenty-four hours before the operation. Empty bowels and bladder. Shave the hypogastric region, pubes, etc. Scrub the abdomen with soap, water, and brush; then wash it with ether, and then with a mild bichloride solution (1 to 3000), and douche the vagina with the last-named solution. The lower limbs to be wrapped in shawls or blankets, and the chest similarly protected from cold.

Instruments, etc.—A bistoury; a scalpel; a director; a dozen hæmostatic forceps; twelve new, clean, aseptic sponges (counted); sponge-holders; scissors; needles; needle-holder; coarse and fine antiseptic silk for sutures; a soft-rubber tube as large as the little finger and two and a half feet long; two hypodermic syringes, together with a fountain syringe, iodoform gauze, antiseptic cotton, flannel bandage for abdomen, and everything necessary for the usual antiseptic dressings. Since the womb in bad cases of delay may be found so far injured as to render a Porro-Müller operation advisable, the additional instruments necessary for this procedure should also be ready, viz.: a Paquelin cautery, a pedicle compressor (Koeberlé's, Tait's, or the *serre-nœud* of Cintrat), and two long, thick needles for transfixing the stump.

Brandy, ether, ergot, digitalis, morphia, strychnia, and plenty of hot and cold water, together with a separate table, provided with appurtenances for resuscitating the child, should be in readiness.

Assistants.—First, the chief assistant to help the operator; second, one for the anæsthesia; third, one to take care of the child; fourth, one to hand instruments; and a fifth ready for anything the operator may desire. The assistants should

receive specific instructions, before the operation, as to what they are to do.

Owing to the *great* danger of *prolonged* delay in obtaining instruments, assistants, antiseptics, etc. (as may occur in country practice), it may well be questioned whether it would not be better to do the operation with a knife, needles, and sutures, using boiled water for antiseptic cleanliness, and having "one physician and a few women" for assistants, rather than waste *very much* time waiting for better appliances.

Operation.—The operator stands on the right side of the patient, who should rest on a high, firm table, with her shoulders slightly elevated and the lower limbs moderately flexed. The chief assistant, standing on the left and facing the patient's feet, steadies the uterus in the median line and produces moderate tension of the abdominal wall over it, by pressing the ulnar border of each hand down on the sides of the uterus while his thumbs rest on the fundus. The incision is then made in the median line. The *length* of this incision depends upon the method of operating selected. There are really *two* methods: *one* with a *short* abdominal incision of four or five inches, during which the operator will take out the child while the womb *remains in the abdominal cavity;* and *another* with a *long* abdominal incision of seven or eight inches, in which the uncut uterus is brought *outside of the abdominal wall before* it is incised and the child extracted.

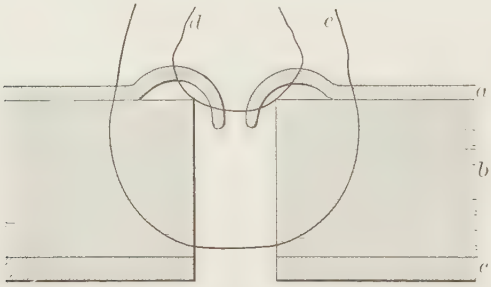
Both operations will now be described.

1. *Operation with Short Incision.*—The incision begins one inch below the umbilicus and ends one and a half inches above the pubes. The tissues are divided, layer by layer, until the peritoneum be reached, through which the womb may be faintly seen. Bleeding vessels may be twisted or ligated before opening peritoneum. Pick up this membrane with artery forceps, nick it, introduce grooved director, and slit it up with bistoury the required length (some operators prefer to make first a *very* short incision, down to and through the peritoneum, then pass in the finger for a guide, and prolong the cut with strong scissors). Next comes the *uterine incision.* Before this is done, the loop of rubber tubing is pushed up, then over the top, and down behind the fundus uteri until it is brought around the lower segment of the womb, its two ends are given to an assistant who crosses them once (without a double knot), and makes some traction, thus

preventing hemorrhage and keeping the womb steadily pressed against the pubes. Another assistant keeps the abdominal walls in close contact with the uterus to prevent extrusion of intestine and entrance of liquor amnii, etc., into the peritoneal cavity. The uterine incision is made in the median line with a scalpel, beginning below, and long enough to admit a finger, which is introduced, and the cut prolonged upward, with scissors, to the extent of four or five inches. If the placenta be inserted just under the incision, never mind that; cut on through as if it were not there. (Formerly it was advised to cut on one side of the placenta, or to separate the part overlapping the incision; this is not necessary, and it wastes time.) The hand now seizes that part of the child near the incision—head, breech, or feet—and extracts it rapidly, the assistant meanwhile making outside pressure to promote uterine contraction. The cord is clamped and cut, and the child handed over to an assistant. The uterus, now reduced in size, is gradually pressed out through the abdominal incision. (Formerly this was *not* done, but the operation was completed while the womb remained inside the abdomen.) The womb is now grasped by the two hands and the placenta delivered by expressing it out through the incision. Should this method *not succeed at once*, the hand is passed into the incision and the placenta carefully peeled off and extracted. The membranes should be twisted out and a finger passed from the uterine cavity through the internal os to insure its being unobstructed for future discharges. The uterus is next irrigated with hot water or a hot mild (1 to 5000) solution of bichloride of mercury. During all these proceedings hemorrhage has been prevented by the rubber tubing held by the assistant, and which will be continued until the uterine wound has been sutured. (Some operators prefer to control hemorrhage by having an assistant grasp the lower segment of the uterus *with his hands*. The rubber tube must not be held so tightly as to injure the tissues, nor must it be continued so long as to cause paralysis and inertia of the uterine wall with consequent hemorrhage; hence the operator, though secure against fear of bleeding from the incision, must not dawdle with the remainder of the operation, but use all prudent expedition in hastening its completion. The longer the peritoneum is exposed to the air, the greater the risk of subsequent peritonitis.) Before suturing the uterine incision, a temporary

tampon of iodoform gauze is placed in the uterine cavity, to be withdrawn before the sutures are tied, and a second gauze tampon introduced with one end of it projecting through the cervix into the vagina, through which it can be withdrawn a day or two after the operation. (Instead of the tampon, some operators dry the uterine cavity and dust it with iodoform.) The *method of suturing* the uterus is *most* important. *First:* deep sutures of large-sized silk, from one-half to two-thirds of an inch apart, the needle to enter half an inch from the edge of the incision, penetrate down to but not through the mucous membrane, and come out half an inch from the opposite edge of the incision. (See Fig. 151.) From eight to twelve of these deep sutures may be required. *Second:*

FIG. 151.



Showing position of sutures in relation to structures in uterine wall. (After GALABIN.)
a, Peritoneum; *b*, uterine muscle; *c*, decidua; *d*, superficial suture; *e*, deep sutures.

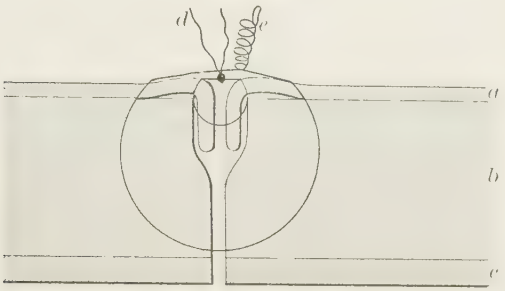
superficial sutures (of finer silk) one-quarter of an inch apart, which pass *only* through the peritoneum, hence called "*sero-serous.*" The cut borders of the peritoneum may be stretched and turned in before the deep sutures are tied. To facilitate this turning in, a little strip of the *anterior* border of the muscular wall may be cut away, leaving an overlapping ledge of peritoneum to turn in; but this takes time; stretching is usually sufficient. (See Fig. 152.) Instead of this turning-in device, the Lembert method of suturing may be used.

When suturing is complete (not before) the constricting rubber tube is removed; and any bleeding points in the

uterine incision should receive additional sutures. The womb is then cleansed and returned to the abdominal cavity, and the operation is completed by suturing the abdominal incision.

2. *Operation with Long Incision.*—The incision extends from a point one and a half inches above the pubes to two inches above the umbilicus: its upper end goes obliquely around, or to the side of (not *through*), the umbilicus. It is made in the same manner as the "short incision" just described. The *object* of the long incision is to make an opening large enough to allow the unwounded womb with its un-

FIG. 152.



Showing the sutures when tied; peritoneal surfaces being brought into contact by the superficial sutures. (After GALABIN.)
a, Peritoneum; *b*, uterine muscle; *c*, decidua; *d*, superficial suture; *e*, deep suture.

disturbed contents to emerge through it, which last is accomplished by pushing the womb up into the incision while the abdominal walls are pressed back over it; when difficult, the proceeding may be facilitated by manipulating the uterus so as to get *one side* of it to protrude first. Take notice, that, owing to the long extension of the abdominal incision, the intestine will be exposed, or protrude at the upper part of the wound, after the uterus is brought outside; therefore, to *avoid this,* long sutures (five or six of them) are *passed* through the upper end of the incision *before* the uterus is disturbed, and remain loose and relaxed, until the uterus is extruded, when they are immediately tightened, and thus the upper end of the incision is quickly closed and the intestine kept back during the remainder of the operation.

The constricting rubber tube is now passed over and down behind the fundus, until it embrace the lower segment of the womb, when it is tightened by the assistant as just previously described in the operation with short incision. The other steps of the operation—incising the uterus, extracting child and placenta, suturing the uterine and abdominal wounds—are essentially the same as when the short incision is done.

After either method of operating the abdominal wound is dressed antiseptically and a dose of ergot (or ergotine) given to maintain uterine contraction and prevent hemorrhage.

After-treatment.—The patient should remain on her back two or three days, the abdominal wall being well supported with a binder, and the vulva dressed antiseptically as in ordinary labor cases. To avoid *vomiting* (which is sometimes a troublesome symptom) *no food* should be taken for twelve hours or even twenty-four, and then at first only liquids, milk, beef-tea, etc., in teaspoonful or tablespoonful quantities as the stomach will tolerate, and repeated at intervals of an hour. Small pieces of ice may be swallowed, which contributes also to relieve thirst. If vomiting persist, support the patient with nutrient enemata and stop all mouth-feeding. The bowels (having been well emptied before the operation) may remain undisturbed forty-eight hours, when, if not acting spontaneously, a soap and water enema may be given, or a glycerine suppository. Should tympanites occur, a teaspoonful of turpentine may be added to the enema. The bladder must be emptied by sterilized catheter every eight hours, if required. If the uterus were packed with gauze during the operation, the tampon must be removed after twenty-four hours, and a second one put in, if desirable, on account of bleeding. The sutures in the abdominal wound should remain ten days. The child should be put to the breast and the woman have the same treatment as after an ordinary labor. If all go well the patient may sit up in bed after two weeks, and sit up in a chair after three.

Porro's Operation (*formerly* "Gastro-hysterectomy" and "Laparo-hysterectomy," also "Ovaro-hysterectomy," *now* "Cœlio-hysterectomy").—It is Cæsarean section with excision of the womb, ovaries, and Fallopian tubes. In Porro's original operation the uterus was incised and the child extracted while the *womb remained in the abdomen*, the organ

was *then* brought out through the abdominal incision and amputated, as described below. In Müller's modification of Porro's operation the uterus is brought out of the long abdominal incision *before* being cut, as just described under Cæsarean Section. The combined methods constitute the "*Porro-Müller Operation.*"

The preparations for the operation are the same as already described for Cæsarean section.

The *cases* in which it is performed are as follows: 1. *Osteomalacia:* apart from the pelvic deformity resulting from this disease, which may require abdominal section, the removal of the ovaries and uterus *arrests the disease of the bones*, which a Cæsarean section does not. 2. Cases of Cæsarean section in which there is *complete inertia of the uterus*, the organ failing to retract, and thus endangering death from hemorrhage. 3. *Morbid growths* of the uterus (fibroid or fibro-myomatous tumors) coexisting with pregnancy. 4. When the uterine cavity is in a condition of septic infection, or when the walls of the organ have been so far injured or inflamed as to render it safer to remove than to leave it. 5. In cases of complete rupture of the uterus and escape of the child into the abdomen. 6. In cicatricial narrowing of parturient canal which would obstruct lochial discharge. 7. It has been advised as being easier to an unskilled surgeon than the careful suturing of the womb required in Cæsarean section.(?) 8. In any extreme case of pelvic obstruction (whether from osteomalacia or other causes) the Porro operation may be done instead of Cæsarean section, when it is desired to unsex the woman and thus *prevent a future pregnancy.*

Operation.—The proceeding is practically the same as before described for Cæsarean section (which see), as far as extraction of the child and placenta. There are *two* chief methods of doing the rest of the operation (and several modifications of them), depending mainly upon the management of the stump or pedicle from which the womb has been cut off. These two methods are: 1. *Extra*-peritoneal; 2. *Intra*-peritoneal. The *extra*-peritoneal operation is the more simple, easy, and capable of rapid execution by an inexpert operator; the *intra*-peritoneal method is tedious and requires a special skill to carry it out successfully.

Extra-peritoneal Operation.—The child and placenta having been extracted as in Cæsarean section, the wire loop of a

Tait's, Cintrat's, or Koeberlé's constrictor is placed round the uterus below the rubber tubing (care being taken to avoid including any part of the bladder or intestine), and tightened until circulation through the uterus is arrested. Then two thick, long needles (ordinary knitting-needles will do) are passed through the cervix at right angles to each other, *below* the wire, which serve, after amputation, to support the stump and keep it *outside* the abdominal incision. (Hence the term 'extra-peritoneal.") The rubber tubing is now removed, and the womb amputated about three-quarters of an inch above the needles. The stump is trimmed down to half an inch from the wire; seared with a Paquelin cautery, or brushed over with a solution of styptic iron to stop bleeding. Subsequent hemorrhage may be arrested by tightening the constrictor wire with a turn of its screw, this instrument remaining in position after the operation. The stump is now fastened by sutures at the lower end of the abdominal incision and the peritoneum stitched to it on all parts of its circumference. The peritoneal cavity is then washed out, and the abdominal incision closed by sutures in the usual manner. The exposed end of the stump is dusted with iodoform and dressed antiseptically with the rest of the wound. The dressings should be renewed as often as they become soiled by leakage from the stump, the constricted portion of which will come away, leaving a granulating surface, in ten or twelve days.

Intra-peritoneal Operation.—In this operation the cervical stump, instead of being exposed at the abdominal incision, is dropped into the peritoneal cavity (hence the term "intra-peritoneal,") or the stump *itself* is removed after amputating the womb, so that the entire uterus (cervix as well as body) is taken out. When the stump is left in after amputation, it is disinfected, its bleeding vessels ligated, and its wounded surfaces drawn together by sutures, after which it is dropped back into the abdominal cavity. When the stump itself is taken out (a much more difficult and tedious proceeding), the uterine and ovarian arteries, on each side, are tied, the broad ligaments secured on each side by strong silk ligatures, the attachment of the bladder to the anterior surface of the lower uterine segment is severed by incising the peritoneum transversely and peeling off the connection with the finger; all other attachments of the cervix to the vagina are cut through, and the stump removed. Any bleeding points are ligated,

the ligatures being left long enough to pass down through the opening into the vagina; this opening being afterward closed by stitching the peritoneal covering of the bladder (in front) to the peritoneal layer facing Douglas's *cul-de-sac* (behind), with a continuous catgut suture. The upper part of the vagina is packed with iodoform gauze. The toilet of the peritoneal cavity, the closure and dressing of the abdominal wound, etc., is done as usual.

Still another method of operating is to *completely invert* the uterus (after taking out child and placenta by the Cæsarean section), so that it is turned inside out and pulled through the vagina so that the cervix is at the vulva, where the amputation and suturing, or complete excision of the stump, may be accomplished

In cases where the cavity of the uterus is the seat of septic infection great care is necessary to prevent any septic fluids entering the peritoneal cavity. For this purpose a large sheet of thin rubber (such as is used by dentists) is perforated with an opening sufficiently large to pass over the fundus and down until it encircle the cervix above the constricting tube; it closely embraces the uterus, and fluids run over it, instead of entering the abdomen. In case the rubber sheet be not attainable, the abdominal wall may be held by the assistant as closely as possible to the sides of the uterus, or, in addition, moist antiseptic towels, previously wrung out, may be packed on each side of the uterus to absorb any overflowing fluids.

The after-treatment in Porro's operation is the same as for Cæsarean section.

Cœliotomy (*Laparotomy, Gastrotomy*) simply means cutting through the *abdominal* wall *only* and removing the child, the latter having already escaped from the uterus, wholly or in part, through a rent, constituting a rupture of the organ. Placenta, membranes, and blood-clots are removed through the wound. The torn edges of the uterine wound are united by antiseptic silk sutures, and the case managed like one of Cæsarean section. In case the suturing fail to arrest hemorrhage, the womb may be constricted and amputated above the cervix by the Porro operation. Laparotomy is also performed in cases of extra-uterine pregnancy, as stated in the chapter on that subject (Chapter XI.).

Cœlio-elytrotomy (*Laparo-elytrotomy, Gastro-elytrotomy*). —The chief purpose of this operation is to deliver through an abdominal incision *without opening the peritoneal cavity or incising the uterine wall.* The woman is placed as for Cæsarean section. Five assistants are required, one on each side of and two facing the operator, who stands on the right of his patient; another gives ether. The os uteri should have been previously dilated, naturally or artificially, and the bowels emptied. One assistant (facing the surgeon's left) draws the uterus upward and to the left, thus stretching the skin in the right iliac region, where the incision is made, one inch above and parallel with Poupart's ligament, extending from a point $1\frac{3}{4}$ inches above and to the outside of the spine of the pubes, to an inch above the anterior superior spine of the ilium. The abdominal muscles are cut, layer by layer, and the fascia transversalis hooked up and carefully incised on a Key's hernia director, to avoid wounding the peritoneum. Branches of superficial epigastric artery may require holding-forceps. With the finger-ends the peritoneum is carefully separated from the transversalis and iliac fasciæ until the vaginal wall is reached. The assistant at the operator's left holds back peritoneum and intestine with a fine, warm napkin; another one draws the body of the uterus upward and to the left, in order to expose vaginal wall on the right side; a third introduces female catheter into bladder, holding it "in the known direction of the boundary line between the bladder and vagina," below the ureter, on the side where the operation is being performed. A blunt wooden or ivory rod, resembling obturator of cylindrical speculum, is passed into vulva and vagina, by which the vaginal wall is lifted and made to protrude at the site of the incision. With a thermo-cautery or galvano-caustic knife (the surrounding parts being protected by wet compresses), the vaginal wall is cut over the projecting rod, parallel with the ilio-pectineal line, and as far below the uterus as practicable, to avoid injuring *ureter*, Douglas's sac, and uterine arteries. The *short* incision thus made is extended by *tearing* with the index-finger ends toward the sacral promontory and pubic symphysis, avoiding, in the latter direction, injury to bladder and urethra. The catheter is then withdrawn, the membranes (if still intact) ruptured, the fundus uteri tilted to the opposite side, and the os drawn by a finger toward the wound, through which the child is then extracted

or delivered by forceps or version, as the presentation may require. The placenta is delivered by "expression" through the incision. The wound is cleansed by carbolized warm water—some of which must be injected *per vaginam*—and the edges of the abdominal incision are united by interrupted sutures, and the abdomen covered with antiseptic dressing. The bladder should be tested for fistulæ by injecting warm milk. If any are discovered they should be sewed up with catgut ligatures, which may remain. A speculum, placed in the wound, may be necessary to secure bleeding vessels during the operation, and, failing in this, the vagina as well as the womb may be tamponed with pledgets of iodoform gauze. This operation is very difficult and requires more than ordinary skill. It is now seldom performed, and, since by improved methods of modern practice, opening the peritoneum is no longer the dangerous proceeding it used to be, there would seem to be little necessity for so complicated and dangerous an operation.

CHAPTER XXI.

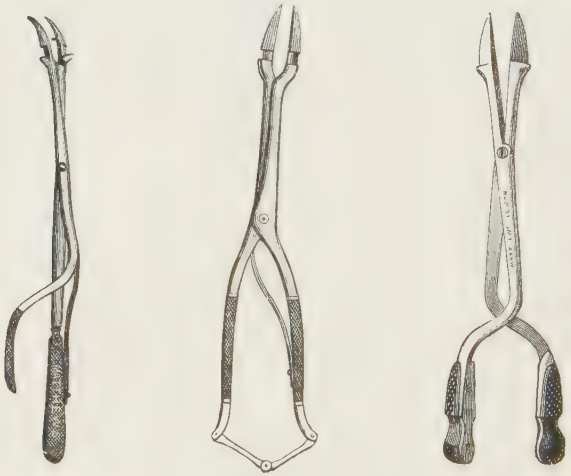
MUTILATING OPERATIONS UPON THE CHILD.

The object of these operations is to reduce the size of the child, or divide it in pieces, so that delivery—otherwise impracticable—may be accomplished. Operating upon the *head* is called "craniotomy," upon the *body* "embryotomy." Since the term "embryotomy" literally means cutting the embryo, it is sometimes loosely used synonymously with "craniotomy."

The conditions requiring mutilation are chiefly malproportion between the size of the child and pelvis, or other mechanical obstacles to delivery, such as impacted shoulder presentation; arrest of mechanism after posterior rotation of chin, in face cases; locked twins, etc. When the child is dead, and delay in delivery endangers the mother's life, craniotomy may be done to expedite a labor that might in time end without artificial aid.

When the child is *alive*, and sacrificing it is necessary to save the mother's life, the choice between craniotomy and abdominal section becomes a serious and difficult responsibility. As a rule, most obstetricians accord superior value to the mother's life. In some cases the necessity of a mutilating operation upon the child, as well as abdominal section upon the mother, may be obviated by symphyseotomy, as already explained. Much will depend upon the *condition* of mother and child, and the chances of their survival after an ab-

FIG. 153. FIG. 154. FIG. 155.



Various forms of perforators.

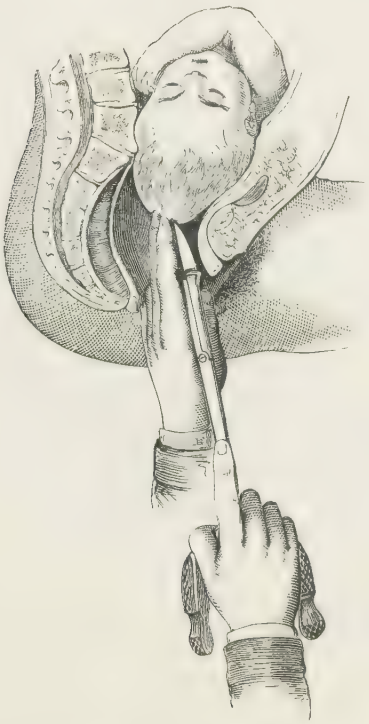
dominal operation. The patient or her relatives, after the chances and conditions have been fully explained, will sometimes decide which course to pursue. In delivery by craniotomy the several steps of the operation are: 1. Perforation; 2. Excerebration; 3. Cephalotripsy; 4. Extraction (delivery) of the head, by several different methods.

Operation.—The patient is placed upon her back on a table of convenient height. Every antiseptic precaution to be rigidly followed. Anæsthesia is not necessary, though desirable to forestall unpleasant memories. The first step is *per-*

foration[1] of the skull. For this purpose various "perforators" ("pierce-cranes") have been devised, most of them modifications of "Smellie's scissors." (See Figs. 153, 154, 155.)

The instrument consists, in brief, of a scissors with long handles and short blades, the terminal inch of the latter form-

FIG. 156.



Perforation of the skull.

ing a triangle whose apex is the point, and at the base of which is an elevated margin, or projecting shoulder-stops, to

[1] The term "cephalotomy," formerly used synonymously with perforation, is here omitted, since it has been more recently applied to an operation which consists in removing the head by segments after dividing it from crown to base with a forceps-saw.



Martin's trephine.

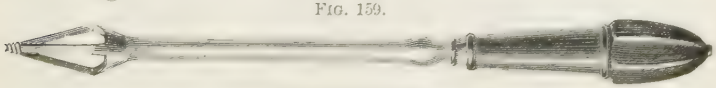


Perforation with Martin's trephine.

prevent a too deep penetration. Unlike ordinary scissors, the *outside* border only of the blade is sharp. Carefully guarded and guided by the fingers while entering the vagina (see Fig. 156), the point of the blade is made to penetrate the skull, as nearly as possible at right angles to its surface, to prevent glancing off, until further penetration is arrested by the shoulder-stops. The handles are then manipulated so as to open the blades, the outer edges of the latter thus making an incision in the cranium. After withdrawing the reversed blade-points from the skull (not from the vagina), the instrument is twisted one-fourth of a circle and again applied as before so as to make a crucial incision. It is then pushed more deeply into the cranial cavity and turned about in all directions to break up the brain and its membranes, care being taken, if the child be alive, to kill it at once by breaking up the medulla oblongata. The points to be preferred for penetration are, in head presentations, the parietal bone; in face cases the frontal bone, orbits, or roof of the mouth; and in retained head following breech presentations, the base of the occiput, behind the ear, or, if the chin can be pulled down, the roof of the mouth as in face cases.

When perforating a head that is *movable* at the brim, it should be held steady by the hands of an assistant making external pressure over the abdomen; or, if practicable, the child may be turned and perforation done on the after-coming head. The operation is easier when the os and cervix uteri are fully dilated, but may be done when dilatation is incomplete, this process being afterward expedited by Barnes's water-bags.

FIG. 159.



Tarnier's perforator.

Besides the scissors, perforators have been constructed on the principle of the trephine. (See Figs. 157 and 158.) A round hole is cut in the cranium, through which the brain may come out, but the scissors are best when it is desired to break up the bones afterward; or the more modern perforator of Tarnier may be used, especially when the head is movable above the pelvic brim, and the scissors are liable to slip off from it. (See Fig. 159.)

Contraction of the uterus, together with resistance of the pelvic walls, after perforation, may cause the brain to ooze out and sufficiently reduce the size of the head to admit of its passage through the pelvis; generally, however, further artificial aid is necessary.

Excerebration (Decerebration) is the next step after perforation. It means removal of the brain. This is done by a scoop or spoon passed in through the opening, or a strong stream of sterilized water, or preferably a warm 1 to 5000 bichloride solution, may be injected with an ordinary Davidson's syringe and the cerebral mass washed out.

When collapse of the head after these measures is still not sufficient for delivery, we proceed to extract it artificially. The several instruments used for this purpose are forceps, the cephalotribe, the cranioclast, the crotchet, and the blunt-hook.

Forceps as an extractor after perforation may be used when there is only moderate resistance to be overcome. In bad cases of obstruction they are apt to slip, nor do they exert sufficient compression to flatten the skull, and hence are seldom advisable.

Cephalotripsy consists in crushing the skull with the cephalotribe, an instrument composed of two thick, narrow, solid blades, which are applied singly (like forceps), and after being locked are made to approach each other by means of a screw running transversely through the handles, so that powerful compression is made upon the skull, and its bones crushed; or, without crushing, the instrument may simply be used for compression and traction after perforation. (See Fig. 160, p. 357.)

The field for the use of this instrument as an extractor is limited. As a rule, it cannot be employed without inflicting serious injury to the mother when the conjugate diameter measures less than two and three-quarters inches.

It may be used to compress the skull before it becomes fixed at the brim, and, as the instrument here seizes the head obliquely, the consequent bulging of the cranium in the opposite direction takes place in the other oblique diameter, where there is usually more space.

If employed below the brim, the instrument is applied to the transverse diameter, and here compression causes bulging

of the head in the antero-posterior direction—just where there is usually less room than anywhere else. Hence, after compression, the head should be rotated into an oblique diameter before traction is attempted.

FIG. 160.



Cephalotribe.

The cephalotribe is sometimes useful in extracting the after-coming head where pelvic contraction is not great.

The Cranioclast.—This is unquestionably the *best instrument for extraction* of the perforated head in cases of narrow pelvis.

It consists of a strong, solid pair of forceps (Figs. 161 and 162) with small, duck-bill-shaped blades, serrated on their opposing surfaces. One blade goes *inside* the skull (through the perforation previously made), the other *outside*, but underneath

FIG. 161.



Cranioclast.

FIG. 162.



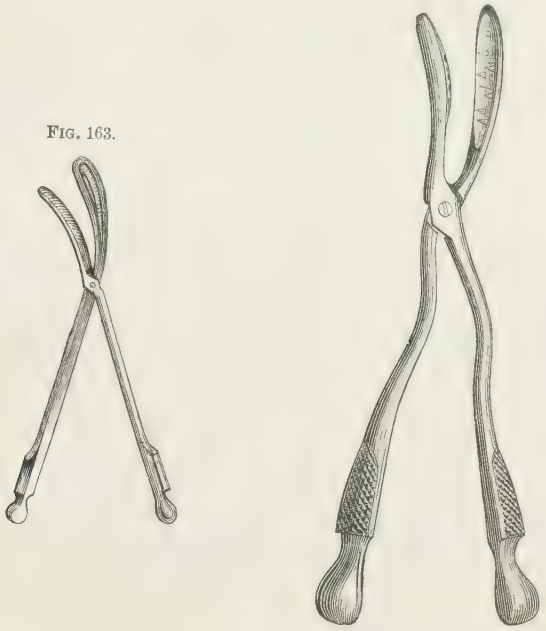
Braun's cranioclast.

the scalp. They are introduced separately, and lock like forceps. When applied, the inside blade, which is smaller than the other and has no fenestra, apposes its convex serrated

surface against the concavity of the cranium, while the outside one—larger and having a fenestra against which the other may press—rests its concave serrated surface upon the convex exterior of the skull. When the handles are brought together after locking, the blades grasp the skull firmly, never slip, and occupy hardly any space, since one is inside the emptied cranium and the other imbedded in the soft tissues

FIG. 164.

FIG. 163.



Craniotomy forceps.

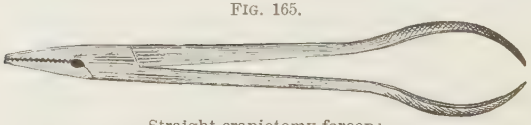
of the scalp. Laceration of the maternal soft parts is avoided, and should the piece of skull grasped by the instrument break off, it is easy to take a fresh hold by changing the position of the blades. Thus the perforated skull in its entirety is extracted. Should the pelvis be too small to render this extraction possible, the cranioclast may be used to break off pieces of bone and deliver in fragments. When the whole vault of

the cranium has been brought away, bit by bit, the larger fenestrated blade of the cranioclast may be placed in the mouth or under the chin, and the smaller blade inside the base of the frontal bones; the intervening tissues are then compressed by turning the screw in the handles of the instrument, and the remains of the head turned round so as to bring the flattened base of the skull into the transverse diameter of the pelvis. The thickness of tissues between the chin and orbital plates, thus grasped, does not exceed two inches, and can hence be drawn through a flattened pelvis but slightly exceeding that measurement antero-posteriorly.

Again, when the cranial vault has been removed, by the cranioclast, etc., extraction of the remaining base of the skull, which is too solid to be broken up, may be facilitated by inserting a blunt hook in the orbit, or getting a firm hold on the forehead with craniotomy forceps, and then, by making downward and backward traction, *bringing down the face.* The symphysis of the lower jaw is next divided, and the two halves of the bone pushed aside or removed, when the remaining portion of the face, from the alveolar border of the upper jaw to the root of the nose—only measuring 1½ inches —may be made to enter the pelvis, and the base of the skull extracted.

In taking away the skull piecemeal, smaller instruments of various shapes and sizes—the craniotomy forceps (Figs. 163 and 164) may be employed.

FIG. 165.

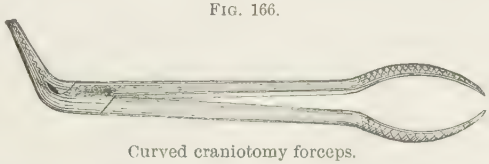


Straight craniotomy forceps.

These differ from the cranioclast in being smaller, and in having their blades permanently joined at the lock, like ordinary tooth forceps. The inner surfaces of the blades are serrated; some are straight, others bent at right angles (Figs. 165 and 166). They are used to grasp, twist off, and extract pieces of bone, the point of *one* blade going *into* the skull, that of the *other outside* of it, but *under the scalp*, this last having been previously loosened from its attachment to the bones.

In all these operations the greatest care is necessary to avoid lacerating the soft parts while withdrawing sharp bony fragments. The vaginal wall must be pushed aside by the fingers, or, better, a large cylindrical or a Sims's speculum used, and the operation conducted under the guidance of sight instead of touch.

FIG. 166.



Curved craniotomy forceps.

The *crotchet* (Figs. 167 and 168) is a steel rod, the end of which, flattened into a sharp triangular point, is bent round, at an acute angle, to form a hook. It is passed into the cranium through the foramen magnum, or through a perforation made in some solid part of the base of the skull, and its

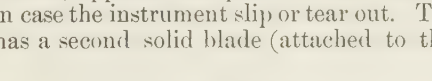
FIG. 167.



Crotchet.

point made to penetrate the bone from within outward, so as to get a hold by which traction can be made. A finger-end is placed outside, opposite the point of the hook, to prevent laceration in case the instrument slip or tear out. The "guard-crotchet" has a second solid blade (attached to the other by

FIG. 168.



Crotchet.

a "lock"), the end of which takes the place of the finger in fitting over the hook to prevent injury. However constructed, the crotchet is a formidable contrivance, and, since fearful laceration will often occur, despite all "guards" and care, is now seldom used.

While the base of the skull is too solid to be broken up with the instruments thus far mentioned, others have been devised specially for this purpose, notably the "basilyst" of Prof. Simpson, and Tarnier's "basiotribe." The operation is called "basiotripsy."

Fig. 169.



Simpson's basilyst.

Simpson's instrument (see Fig. 169) consists of a rod whose distal end terminates in a conical screw; both the rod and the screw are split longitudinally, and so arranged that the two halves may be forcibly separated by a device at the handle. The screw is passed into the skull—through the opening previously made by perforation—until it come in contact with the base, which, by a boring motion, it is made to penetrate until the instrument is well fixed, when, by pressing the two parts of the handle together, the two halves of the screw separate (see Fig. 170) and break up the bone.

Fig. 170.

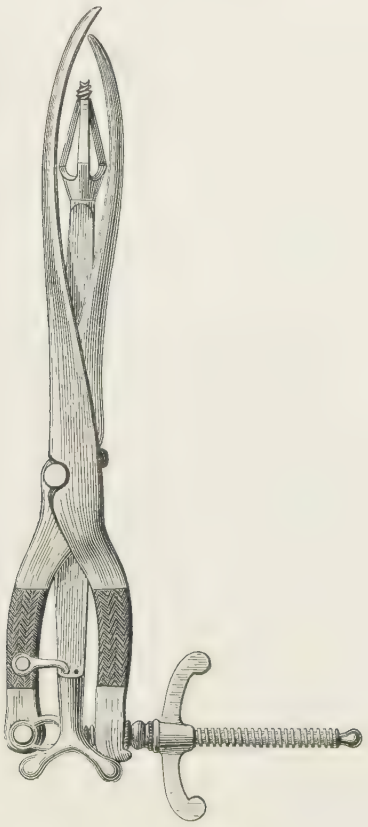


Simpson's basilyst when applied.

Tarnier's "basiotribe" (see Fig. 171) is composed of three pieces, viz., two strong blades and a central shaft. The central shaft, at its distal end, terminates in a hollow cone of four bars, the apex of which is a screw. In using the instrument, the central bar, by itself, is bored into the dome of the skull (perforation), then pushed on through the brain, until the screw come in contact with the base and penetrate it. The two blades (one long and one short) are then introduced, one on each side of the head, as shown in Fig. 172 (p. 364), and crushing of the skull produced by turning the compression screw passing through the handles. The instrument is really a cephalotribe, with the addition of a third blade or shaft for

breaking up the base of the skull. The shaft is provided with a button pivot, by which it is locked securely to the other blades when applied. After using the device successfully the

FIG. 171.

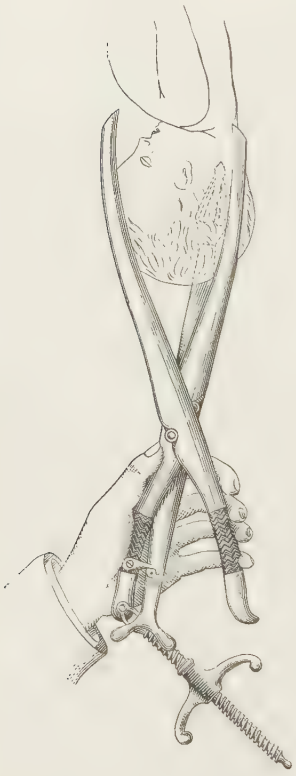


Tarnier's basiotribe.

skull will be crushed and reduced in size, as shown in Fig. 173 (p. 364), the outline sketch representing the shape of the compressed cranium.

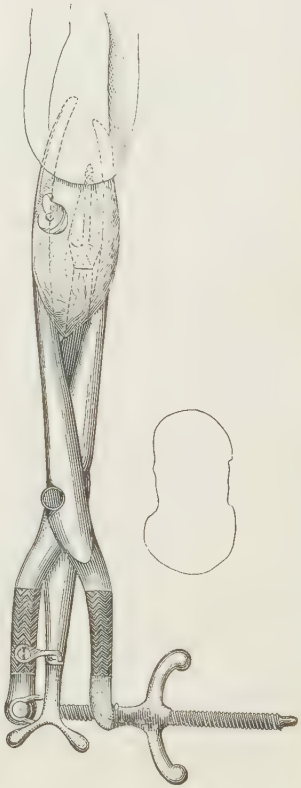
Generally speaking, a pelvis sufficiently large to allow extraction of the head by craniotomy will permit the body to pass without mutilation. It may be necessary, however, to

FIG. 172.



Application of Tarnier's basiotribe.

FIG. 173.



Basiotripsy accomplished.

pull on the neck until a blunt hook can be passed into the axilla, by which the shoulders—first one, then the other—may be drawn out.

Exceptionally it may be required to perform embryotomy.

EMBRYOTOMY.—This embraces two operations, viz.: evisceration and decapitation.

EVISCERATION (EXVISCERATION, EXENTERATION) means opening the thoracic and abdominal cavities (one or both), and taking out their viscera.

It may, though very rarely (as just explained), be necessary in extracting the body after craniotomy, or when there is some abnormal enlargement, or monstrosity, on the part of the child. It is resorted to more frequently in impacted transverse presentation, arrested "spontaneous evolution," etc.

Operation.—The thorax is penetrated near the axilla by curved scissors or the pierce-crane, and the thoracic organs broken up and removed, either by instruments, or, if practicable, by the fingers. Through the same opening the diaphragm may be perforated and the abdominal viscera removed. The same care is necessary as in craniotomy to avoid lacerating the vagina with splinters of bone.

When evisceration is performed subsequent to craniotomy, the body may be afterward drawn out by a blunt hook in the axilla, as above directed.

In impacted transverse presentations the eviscerated body may be delivered in one of three ways, viz.: 1, by traction on the arm and shoulder; 2, by passing a blunt hook to the groin and pulling down the breech; 3, by grasping the feet and delivering by podalic version. Which mode is to be selected must be left to the judgment of the obstetrician, much depending upon the position of the child, its size, and the shape and dimensions of the pelvis.

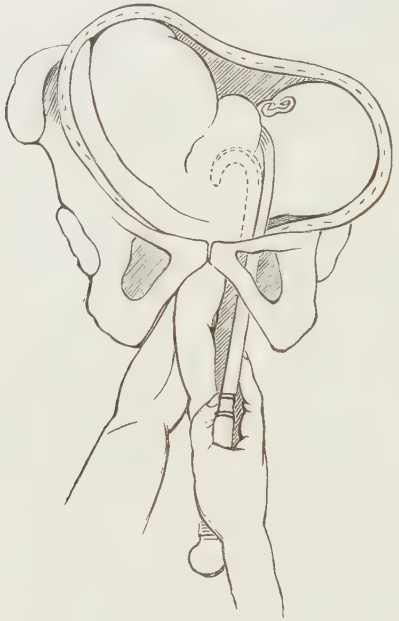
DECAPITATION—separating the head from the body—is required in impacted shoulder presentations, or arrested "spontaneous evolution," when the child is jammed tight in the pelvis and cannot be moved up or down.

Operation.—Get down an arm for traction, pass a blunt hook around the neck, and while it is held as low down as possible, nibble through the vertebræ and soft parts with a blunt-pointed pair of scissors. Cut everything, so that the hook or finger may be passed through the incision to ascertain that the head and body are *completely* separated.

Another device is that of a blunt hook, whose inner concave surface is made sharp. It is introduced while lying flat,

as shown by the dotted lines in Fig. 174, until its end is far enough up to be turned over the neck. The hook having been passed over the neck, the latter is separated by rocking the handle of the instrument up and down while traction is made. Keep a finger on the end of the hook, and reduce the traction force when severance is near completion, to prevent injury from sudden release of the instrument.

Fig. 174.



Decapitation.

Other contrivances consist of chains, wires, and strings passed round the neck, and through a long, double canula, to protect the vagina, while, by a sawing to-and-fro movement, the neck is severed.

After decapitation, the head is pushed up out of the way and the body delivered first, by traction on the arm, evisceration, etc. The remaining head is then extracted by forceps,

or, if required, by craniotomy. In attempting the latter operation upon a decapitated head, extra care is necessary to prevent slipping of the perforator. An assistant steadies the uterus by firm abdominal pressure to keep the head from revolving while the instrument is being used.

Finally, in all mutilating operations upon the child *when it is alive*, the chances of a successful cutting operation upon the mother for its safe removal should first receive consideration. In deciding which course to adopt, the value of the mother's life must be allowed the pre-eminence.

CHAPTER XXII.

PELVIC DEFORMITIES.

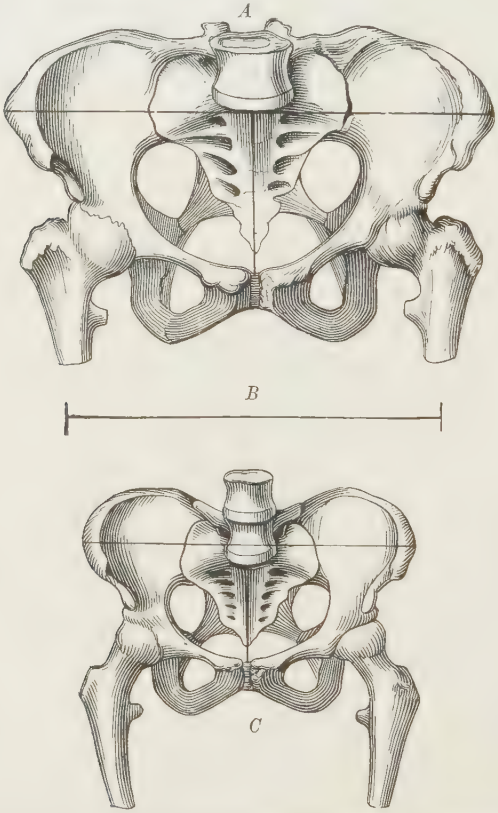
A GENERAL study of pelvic deformity is necessary, in order that we may learn to ascertain—at least approximately—the *degree* and *kind* of malformation existing in a given case. A knowledge of the *degree* of deformity indicates whether delivery by the natural passages be or be not practicable, and determines the mode of assistance by operative measures. A knowledge of the *kind* of malformation, derived chiefly from examination of specimens in museums, indicates what diameters are most likely to be altered in length, and what parts of the pelvis—brim, cavity, or outlet—are chiefly affected, thus determining necessary modifications in the mechanism of labor, and indicating the *time* and *manner* of rendering assistance.

By far the most frequent variety of deformity is that in which there is a *shortening of the conjugate* (antero-posterior) diameter of the *brim*, and while slight variations in size and shape are almost endless in number, twelve distinct types may be enumerated, each of which will now be considered.

1. THE SYMMETRICALLY ENLARGED PELVIS (PELVIS ÆQUABILITER JUSTO-MAJOR).—Shape natural; size, in all directions, increased. (See Fig. 175.) A congenital condition. Labor is apt to be unnaturally rapid, with consequent

liability to inertia of the uterus and post-partal hemorrhage, and there is increased tendency to uterine displacements. *Treatment:* Confine the woman to the recumbent posture as

FIG. 175.

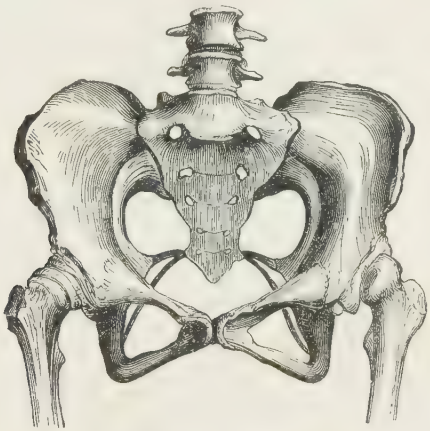


A. Justo-major pelvis. *B*. Normal inter-crestal diameter. *C*. Justo-minor pelvis.

soon as labor begins; rupture the membranes early, before the os is dilated, and enjoin resistance to bearing-down efforts, that labor may be prolonged. Extra care to secure uterine contraction during third stage of labor.

2. The Symmetrically Contracted Pelvis (Pelvis Æquabiliter Justo-minor).—Shape natural; size, in all directions, lessened. (See Fig. 175.) A congenital variation. Labor difficult or impossible, according to degree of contraction. Occurring in dwarfs, children may sometimes be born without difficulty.

Fig. 176.



Adult pelvis retaining its infantile type.

3. The Juvenile Pelvis.—Shape resembles the pelvis of infancy and childhood. (See Fig. 176.) It is an arrest of development. Transverse measurements relatively shorter than the conjugate, owing to narrowness of sacrum. Sides of pelvis unnaturally straight, pubic arch narrow, and ischia too near together. Labor difficult or impossible *pro re nata.*

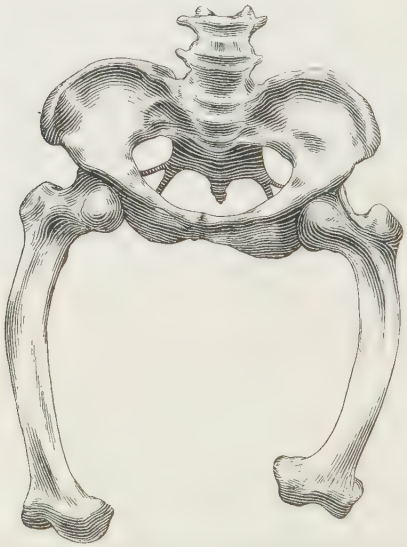
In precocious mothers time may remedy the *deformity.*

4. The Masculine Pelvis.—Sometimes called "funnel-shaped." It is deep and narrow, resembling that of a male, the narrowness increasing from above downward; hence obstruction to labor, most marked toward the outlet. The pelvic bones are thick and solid, a condition thought to be produced by laborious muscular work only suitable for men.

5. The Pelvis of Rickets (Rachitis) (see Fig. 177).—Sub-varieties numerous. The *typical* rachitic pelvis is the

most common, and hence most important, of all deformities. Obstruction to labor chiefly at the *brim*, by shortening of *conjugate diameter*. Transverse diameter may be either long, short, or normal. Rickets occurs in early life. The child, from muscular weakness, etc., fails to *walk*, hence long continuance in sitting posture forces promontory of sacrum forward and downward toward pubic symphysis. If the child *do* walk, counter-pressure of thigh bones in actabula forces in

FIG. 177.



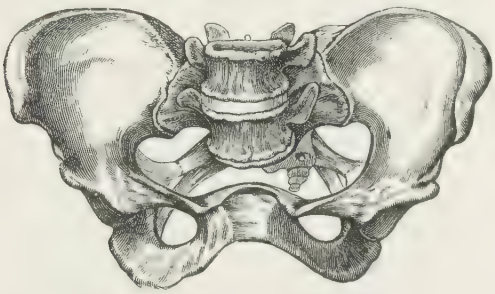
Flat rachitic pelvis. (Mütter Museum, College of Physicians, Philadelphia.)

the *sides* of the pelvis, and then *transverse* diameter is *also* shortened. *Cavity* of the pelvis not generally contracted, a sitting posture rather tending to squeeze the ischial bones apart. The *outlet* may be lessened by sharp inward curvature of sacral apex toward pubes.

Exceptionally the symphysis pubis is drawn (by contraction of recti muscles?) toward the sacral promontory, producing so-called figure-of-8 pelvis (see Fig. 178), and, *rarely*, the sacrum may *lack* curvature, thus lessening the size of the pelvic *cavity*.

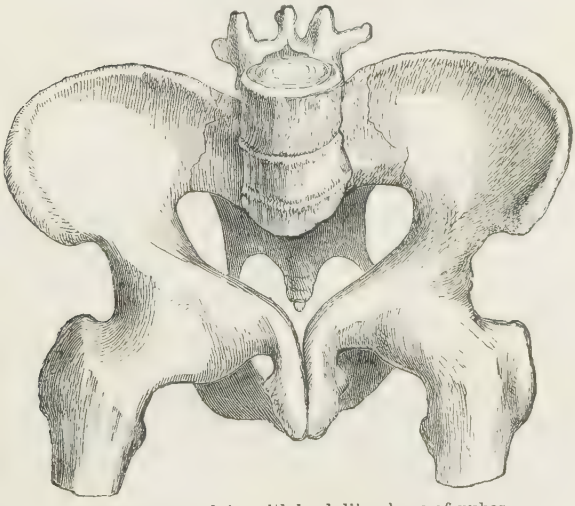
The rickety pelvis is a most prolific cause of difficult labor. The degree of obstruction may require mutilation of the child, or even necessitate cutting operations upon the mother. (For general rules in selecting the mode of operation, see page 387.)

FIG. 178.



Rachitic pelvis, with backward depression of symphysis pubis.

FIG. 179.

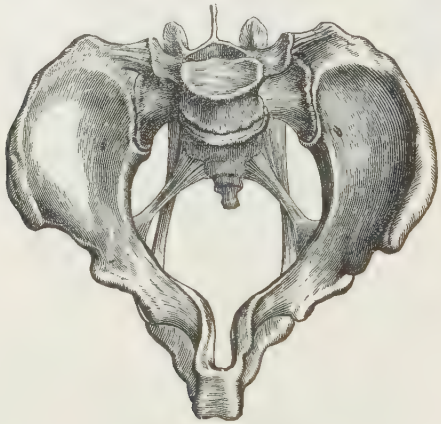


Osteomalacic pelvis, with beak-like shape of pubes.

6. THE MALACOSTEON PELVIS (see Figs. 179 and 180) resulting from osteomalacia—a uniform softening of the bones

occurring in *adult* life. It may come on in women who have previously borne children without difficulty. Its progress being gradual, the patient is able to *walk* about, hence pressure of thigh bones in acetabula pushes in the *sides* of the pelvis, shortening the *transverse* diameter. Anterior border

Fig. 180.

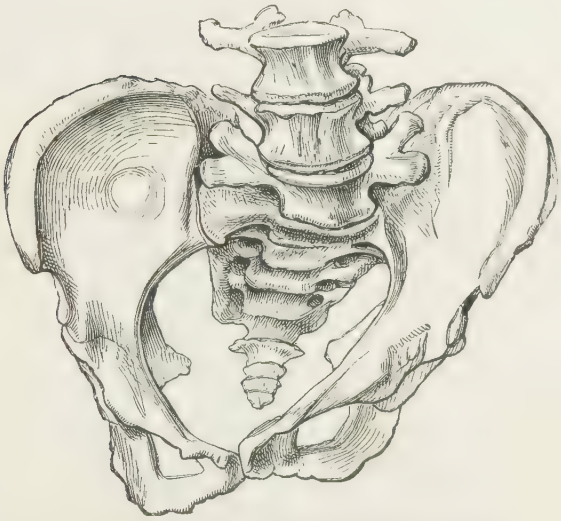


Osteomalacic pelvis.

of pelvic brim has a spout-shaped or beaked appearance. Exceptionally, and in very bad cases, the oblique and conjugate diameters may be also contracted. Osteomalacia is about four hundred times less frequent than rickets. Craniotomy or Cæsarean section may be required for delivery. Sometimes the softened bones yield and admit the passage of the child by other methods.

7. The Oblique Deformity of Naegelé (see Fig. 181). —The sacro-iliac synchondrosis of *one* side is anchylosed, the corresponding wing of the sacrum atrophied, or imperfectly developed, so that the acetabulum of *this* side approaches the healthy sacro-iliac synchondrosis of the other, shortening the oblique diameter between these two points. The other oblique diameter, starting from the *diseased* sacro-iliac synchondrosis, is lengthened, owing to the symphysis pubis and acetabulum

FIG. 181.



Oblique deformity of Naegelé : disease on *left* side.

FIG. 182.

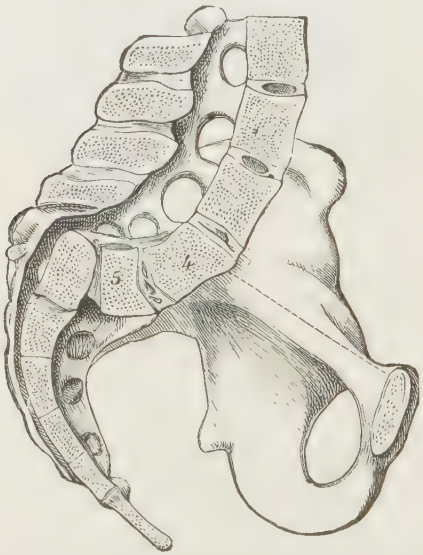


The Roberts pelvis.

of the healthy side being forced out of place toward the sound side of the median line. This variety of deformity is comparatively rare.

8. The "Roberts Pelvis" (see Fig. 182).—A double oblique deformity. *Both* sacro-iliac synchondroses anchylosed, and *both* wings of the sacrum absent or undeveloped. The brim is oblong; pelvic sides more or less parallel with each other; ischia pressed toward each other, and sides of pubic

Fig. 183.



Spondylolisthetic pelvis: 4, fourth lumbar vertebra; 5, fifth lumbar vertebra. (Kilian.)

arch nearly parallel. Transverse diameter *universally* shortened at brim, cavity, and outlet. Obstruction very great, requiring Cæsarean section. It is really the oblique deformity of Naegelé occurring on both sides, and is extremely rare.

9. The Spondylolisthetic Pelvis (see Fig. 183), due to forward and downward dislocation of the lumbar end of

the spinal column, from its proper place of support on the base of the sacrum. It produces marked contraction of conjugate diameter of the brim, and, owing to sacral promontory being forced somewhat backward, the apex of sacrum

FIG. 184.



The kyphotic pelvis.

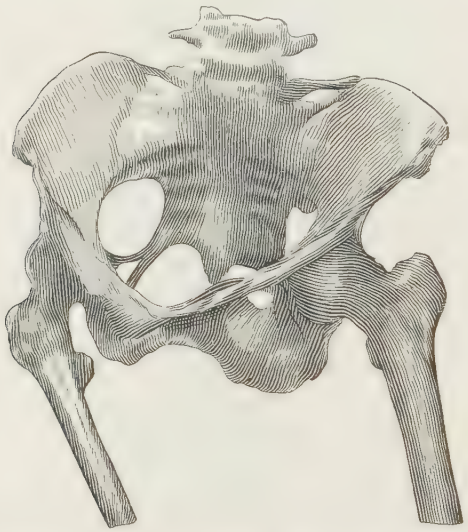
may be tilted forward, thus lessening conjugate diameter of outlet. Degree of obstruction very great, sometimes requiring last resorts in operating.

10. THE KYPHOTIC PELVIS (see Fig. 184), due to backward curvature of the spinal column near its lower end. Patient short in stature, and, of course, "hump-backed." The sacral promontory is absent or drawn backward out of reach, thus

lengthening conjugate diameter of brim, but *contracting* its *transverse* measurement. The apex of sacrum is tilted forward, and the two ischia and two sides of pubic arch approach each other, so that *all* the diameters of the *outlet* and some of the cavity are diminished. Obstruction chiefly at the inferior strait.

11. Deformity from Hip Disease (see Fig. 185).—Coxitis (inflammation of the hip-joint), occurring in early life, causes the patient to rest the weight of the body on

Fig. 185.



Obliquely contracted pelvis from coxalgia: coxitis on right side, deformity on left. (Mütter Museum, College of Physicians, Philadelphia.)

the healthy hip, while the lame one is not used. Consequently the healthy side of the pelvis is gradually pushed over toward the diseased side, producing an oblique deformity resembling the oblique pelvis of Naegelé. The earlier in life the disease begins the greater the deformity. In Fig. 185 the *right* side is the diseased one; the *left* half of the pelvis, having supported the weight of the body upon the left ace-

tabulum, is pushed over toward the right side. Thus that side of the pelvis having the *normal* hip-joint *is* deformed; the other one *not* so. The deformity is not *usually* sufficient to seriously obstruct labor, but *may* be so exceptionally.

12. Deformity from Exostosis, etc. (see Fig. 186).—Bony and osteo-sarcomatous tumors growing from pelvic bones—most often from front of sacrum—project into pelvic

Fig. 186.



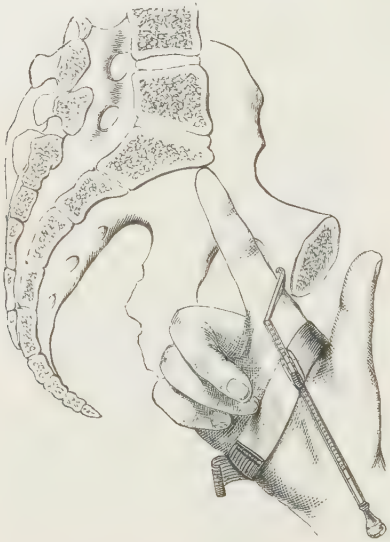
Bony tumor of sacrum.

cavity and produce obstruction. Bony projections also occur from callus resulting from fracture of the bones. The ischial spines are sometimes too long, and encroach upon the pelvic canal.

Ordinary Symptoms of Pelvic Deformity without Reference to any Special Case.—Previous history of difficult labors, and of the diseases or accidents by which pelvic deformity is produced. Early recognition of quickening by the patient (third month). Pendulous belly. Increased obliquity and mobility of the pregnant womb. Greater liability to malpresentations and to presentation and prolapse of the funis. During labor the finger can be more easily

introduced between the lips of the os uteri and bag of waters. Os uteri movable from side to side. Presenting part high up, or out of reach, when brim contracted. Pains intense without proportionate progress in descent of presenting part.

FIG. 187.



Greenhalgh's pelvimeter.

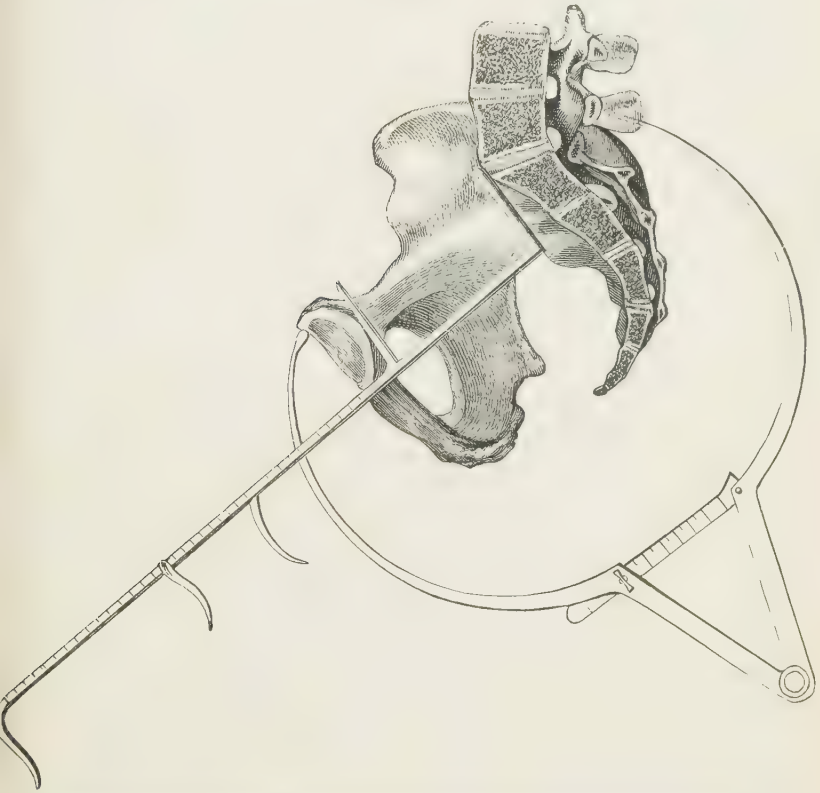
Later, "arrest" of the head (it descends no further), or "impaction" (when it cannot be moved, either up or down). Caput succedaneum unusually large; its gradual swelling may be mistaken for progress in descent.

ADDITIONAL SYMPTOMS IN SPECIAL CASES.—In *rickets:* "bow-legs," curved spine, and other deformities of the skeleton, with history of rachitis in early life.

In *osteomalacia* (malacosteon): probable history of previous labor without difficulty, the disease beginning soon after a delivery. Symptoms of osteomalacia are: pains in bones of pelvis and lower limbs; bones tender on pressure, especially over symphysis pubis. They are also pliable, yielding to

manual pressure during labor. Old-standing cases of *hip disease* present previous history of coxalgia. The diagnosis

FIG. 188.



Baudelocque's calipers. This figure also shows Coutouly's pelvimeter applied.

in the above cases must be confirmed, and in the other varieties made out almost entirely, by measuring the pelvis (Pelvimetry).

PELVIMETRY may be accomplished both by internal and external measurements. The best *pelvimeter* (pelvis-measurer) is the *hand.*

To measure conjugate diameter of the brim, pass index finger under pubic arch and rest its point against sacral promontory.[1] (See Fig. 190.) (It is not possible to *touch* the promontory in a *normal* pelvis.) With a finger-nail of the other hand make a mark on the examining finger where it touches the pubic arch. Withdraw the finger and measure (with a rule) from the mark to its tip. From this measure-

FIG. 189



Collyer's pelvimeter.

ment deduct half an inch, and the remaining length gives the conjugate diameter of the brim. The half-inch is subtracted because the length as measured from the promontory to the *under* surface of the pubic symphysis (the *diagonal* conjugate: see Fig. 4, page 37), is half an inch longer than from the promontory to the *upper* surface of the pubic joint, the latter

[1] Take care not to mistake the (sometimes prominent) junction of first and second sacral vertebræ for the *real* promontory.

being the *brim* measurement it is desired to ascertain. During this examination the woman should lie on her back with the hips elevated.

Another method: Patient lies on her left side, near the edge of the bed. Etherize, if necessary, to prevent pain. In-

FIG. 190.

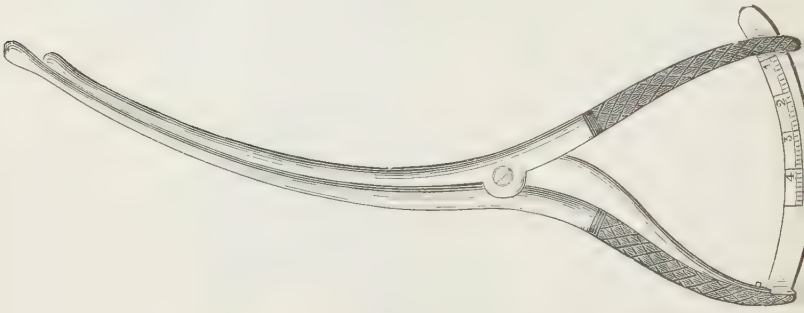


Pelvimetry with the finger.

troduce entire hand into vagina, and dispose it flatwise with the little finger toward symphysis pubis and the index-finger against sacral promontory. Learn how many fingers can thus be *simultaneously* introduced between the two points. The breadth of four fingers, in a hand of average size, is about two and three-quarters inches. The fingers introduced may be afterward measured by a rule.

Of the numerous instrumental pelvimeters for internal use, those of Dr. Lumley Earle and Dr. Greenhalgh (Fig. 187, page 378), are probably the best; but they can scarcely be

Fig. 191.



Lumley Earle's pelvimeter.

used during labor, when most often needed, and give no better results than the hand under any circumstances.

The *transverse* and *oblique* diameters of the *brim* can only be roughly estimated.

External Pelvimetry. — The pelvimeter of Baudelocque, or some modification of it, is generally used. It is a pair of circular calipers, a scale near the hinge indicating the space between the open ends when applied. (Fig. 188, page 379.) An inexpensive instrument is that of Collyer. (See Fig. 189, page 380.)

To measure conjugate diameter of brim, the woman lying on her side, place one point of the instrument upon the *upper* edge of pubic symphysis, and the other opposite sacral promontory—*i. e.*, over the depression just below spinous process of last lumbar vertebra. (See Fig. 188, page 379.) Normally this should measure 7½ inches. Deducting 3½ for thickness of bones and soft parts, leaves 4 inches—the normal length of the brim's conjugate diameter. The degree of reduction in this measurement, allowing for individual variation from obesity, etc., will give, *approximately*, the amount of pelvic contraction, but a limited reliance only can be placed upon this method without other corroborative evidence of deformity.

Two other external measurements are also useful, viz., (1) between the two anterior superior spinous processes of the ilia (normally 9½ inches); and (2) between the most laterally projecting points on the two *crests* of the ilia (normally 10½ inches). When both measurements are reduced it indicates a uniformly contracted pelvis. When the inter-crestal measurement is normal, or only a *little* diminished, while the interspinous one is increased, it indicates a pelvis with conjugate contraction of the brim, but otherwise normal. When *both* measurements are *decidedly* diminished, while the interspinous one exceeds the inter-crestal, other diameters are contracted *beside* the conjugate.

Diagnosis of the Oblique Deformity of Naegelé. — Lameness, from inequality in the height of the hips. If two plumb lines be suspended, one from the centre of the sacrum, the other from the symphysis pubis (the patient standing erect), the pubic one will deviate toward the healthy side. Measuring from the spinous process of the last lumbar vertebra to the anterior and posterior spinous processes of the ilia, will show a reduction of half an inch or more on the diseased side. Anatomical features of the deformity, already described, to be further made out by vaginal examination.

Diagnosis of the Kyphotic Pelvis.—Mensuration reveals marked narrowing of space between tuberosities of the ischia, between ischial spinous processes, and between sides of pubic arch. Space between anterior superior spinous processes of ilia decidedly increased. Absence of sacral promontory and other anatomical characters revealed by vaginal touch. Humpback visible by inspection.

Diagnosis of Spondylolisthetic Pelvis. — Figure peculiar; thorax normal; abdomen short and sunken between crests of ilia, the latter widely separated. Aortic pulsations felt through posterior vaginal wall. History of violent pains in sacrum at puberty. (?) Vaginal examination reveals dislocation at sacro-lumbar articulation.

Diagnosis of "Roberts's Pelvis."—Owing to narrowness of sacrum, the spaces between the two iliac crests, between the two iliac spines, between the two trochanters, and between

the two ischial tuberosities, are all reduced. The two posterior-superior iliac spinous processes, especially, approach each other.

Diagnosis of Masculine Pelvis.—Mensuration demonstrates diminished width between pubic rami and between ischial tuberosities, etc. No obstruction of labor at superior strait; head arrested in pelvic cavity.

Dangers of Pelvic Deformity.—Tedious labor; shock; exhaustion, and inertia of uterus from prolonged contractile efforts. Inflammation, ulceration, and sloughing of maternal soft parts from contusion and prolonged pressure. Child's life jeopardized by prolapsed funis; by continued and exaggerated compression of cranium, especially against sacral promontory. Operative measures for delivery may necessitate destruction of infant.

Fig. 192.



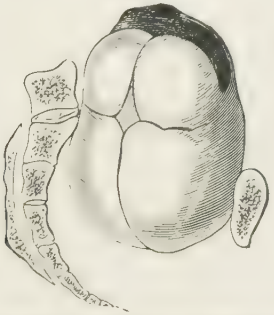
Head passing through inlet in flat pelvis. (After Parvin.)

Modifications in Mechanism of Labor when Conjugate Diameter of Brim only is Contracted.—Flexion is imperfect. The occipito-frontal diameter of head occupies transverse of pelvic brim. The bi-parietal diameter is tilted so that one end is lower than the other,[1] hence the *anterior*

[1] This lateral tilting of the *head* is sometimes spoken of as the "*obliquity of Naegelé*;" it is quite separate from, and has nothing to do with, the oblique deformity of the *pelvis* described by Naegelé.

parietal boss presents near the pubes, while the *posterior* one is tilted backward and *upward* toward posterior shoulder, which carries the sagittal suture toward the sacral promontory. (See Fig. 192.) Thus anterior end of bi-parietal diameter is permitted to descend before posterior one; there is not space for *both* to enter *simultaneously*. The somewhat wedge-shaped *sides* of head impinging against promontory and pubes, now cause occiput to slip, laterally, toward that ilium to which it points, thus bringing the narrower bi-temporal diameter (3¼ inches) to occupy the contracted conjugate in place of the wider bi-parietal one. As descent thus proceeds, the forehead and larger fontanelle are lower than

FIG. 193.



Marked flexion of head entering a generally contracted pelvis. (After PARVIN.

occiput and small one; but, later, flexion occurs, which brings occiput down on one side of pelvis, while forehead rises up on the other. In this way the brim is passed, when, the chief difficulty being over, occiput rotates to pubes, and labor is completed in the usual manner.

MODIFICATIONS IN MECHANISM OF LABOR WHEN PELVIS IS UNIFORMLY CONTRACTED.—The head may enter in any pelvic diameter, though usually in the oblique. Flexion is unusually complete, so that occipital pole of occipito-mental diameter points almost vertically down at right angles to plane of superior strait. (See Fig. 193.) The "obliquity of Naegelé" is very slight or absent. Both parietal bosses enter at the same time. Small fontanelle found near centre of

pelvis. Should transverse narrowing continue toward outlet, the *extreme flexion* continues, with liability to impaction and arrest; but if the pelvis widen below the brim, the exaggerated flexion lessens, and the occipital pole of the head leaves its central position, and rotates, in the more favorable cases, toward the pubes, when delivery follows in the usual way.

Modifications in Mechanism of Labor when Pelvis is "Generally Contracted" with Antero-posterior Flattening.—In this case we have the "Naegelé obliquity" of flattened pelvis, joined with the exaggerated flexion of justo-minor cases. The occipito-frontal diameter of the head usually occupies the transverse diameter of the pelvis. If delivery be possible, strong flexion causes the occiput to descend first.

Defects in Mechanism requiring Rectification.—In pelves with very narrow conjugate and high promontory, especially, but sometimes in others that are less so, the "obliquity of Naegelé" is *over*-done. The posterior parietal bone is directed *too* strongly toward posterior shoulder, so that sagittal suture may be even *above* sacral promontory, and the ear be felt just behind pubic symphysis. In flattened pelves with transverse shortening, the obliquity may be the other way: the *posterior* parietal bone presenting, the sagittal suture being toward or even above pubes, while an ear is felt near promontory. Again, the proper deficiency of flexion in the early stage of labor in flattened pelves may be overdone, thus leading to brow or face presentation, and in which anterior rotation (respectively) of forehead or chin will be impossible later on.

During breech deliveries, in contracted pelves, the arms may be displaced to the sides of the head, and this last may be unfortunately extended by the chin catching against the pelvic brim. In marked transverse shortening, extension of the chin in breech cases makes delivery impossible without perforation.

Methods of Assisting Delivery in Pelvic Deformity.—Excluding, for the present, the induction of labor before full term (to be considered in the next chapter), the resources of the obstetrician in pelvic deformity are: Forceps, version,

craniotomy, Cæsarean section (or one of its allied abdominal operations), and symphyseotomy.

The definition of *precise* rules for deciding which of these procedures must be selected in a given case is a quite impossible undertaking. Of the many points to be considered, one of the most important is the degree of shortening in the conjugate diameter of the superior strait. In so far as this is concerned, it may be stated as a *general* rule, which, however, must be accorded sufficient elasticity to allow of its conforming to other elements of importance hereafter noted, that

When conjugate diameter of brim measures—	The proper mode of delivery at term is
Between 4 and 3½ inches,	By forceps.
Between 3½ and 2¾ "	By version.
Between 3¼ and 2¾ "	By symphyseotomy *with* forceps or version, if these two last-named operations fail *without* it.
Between 2¾ and 1¾ "	By abdominal section, or, if child be *dead*, by craniotomy. Symphyseotomy *with* craniotomy as we approach the smaller figures.
Below 1¾ inches	By abdominal section, *not* by craniotomy, nor by symphyseotomy.

As before stated, and as a matter of course, selection of the method of delivery must *not* depend *solely* upon the length of the conjugate diameter. Since we cannot during labor measure the pelvis *exactly*, and still less the child's head, the impossibility of mathematical rules for practice is painfully evident.

Furthermore, no two sets of cases are exactly alike, and the experience of no two practitioners exactly similar; hence hardly any two authorities exactly agree with regard to the pelvic measurements determining the kind of operation to be employed. In cases with the *larger* figures above mentioned, the operation called for will be comparatively easy; with the *smaller* measurements, more difficult.

Among the host of other considerations upon which our selection must, in part, depend, may be mentioned: 1. The

kind of contraction; whether (*a*) simple antero-posterior flattening, or (*b*) general contraction, or (*c*) both of these combined. 2. The site of contraction; whether at brim, cavity, or outlet. 3. The estimated size of the head and its degree of ossification. 4. Whether or not it be "arrested," or "impacted" (and at what point in the pelvis), or have passed through the os uteri. 5. The amount of dilatation of the os, and the state of the membranes. 6. Retraction of uterus above the head with consequent vertical tension of vaginal wall. 7. Is the child dead or alive, and, if the latter, will its life be jeopardized or lost by the proposed operation? 8. History of former labors (if any) and results of methods then employed. 9. The *number* of previous deliveries, as indicating present labor-power. 10. Imminent danger or actual occurrence of uterine rupture. 11. General condition of woman as regards her ability to survive the proposed operation. 12. The "presentation" and "position" of the child. 13. The existence of complications, such as hemorrhage, eclampsia, placenta prævia, prolapsed funis, etc. 14. The estimated knowledge, acquired skill, and native dexterity of the operator, together with (what is not often sufficiently considered) the *kind of hand* he happen to possess, whether small, soft, and pliable, or the reverse.

An approximate estimate of the *size* and *consistency* (hard or soft) of the child's head may be obtained by external palpation over the lower abdomen. In this way also may we ascertain whether the widest (bi-parietal) diameter have or have not entered the brim, and whether it be possible to force the head into the brim by manual pressure from above.

As much must depend upon whether the child be alive, we may here note the signs of its death.

Signs of Fœtal Death in Utero.—Some of these have already been mentioned in the chapter on "Abortion" (page 173). Additional ones recognizable during labor are: Cessation of fœtal heart-sounds after they have been previously recognized; cessation of quickening, especially when immediately preceded by irregular and tumultuous fœtal motions. The discharge of meconium, when the case is *not* a breech presentation, is of some significance. In *head* presentation the scalp is soft and flabby; the cranial bones are loose and movable, and may be felt to grate against or overlap each

other more than usual. No *caput succedaneum* is formed during labor, since there is no circulation in the scalp to produce it. In *breech* cases the anal sphincter is relaxed and does not contract on the finger. In *face* cases the lips and the tongue are flabby and motionless. In *arm* presentation the *living* limb is warm, perhaps somewhat livid or swollen from pressure above, and it may be made to move; not so the *dead* arm. In *funis* presentation the living cord is warm, firm, turgid, and pulsatory; the dead one cold, flaccid, empty, and pulseless. Some of the above signs, it will be evident, can only occur when the child has been dead some time before labor—the condition of the scalp and cranial bones, for example.

METHODS OF DELIVERY.—By far the most common, and therefore, to the general practitioner, most important, variety of pelvic deformity is that in which there is simple flattening of slight degree, at superior strait (conjugate of brim measuring between 4 and $3\frac{1}{2}$ inches). Some of these *may* be delivered without artificial aid, provided the pains be strong, the presentation correct, and the mechanism follow its normal course, while other conditions are favorable. Should symptoms of exhaustion begin (see Chapter XXIX.), or complications render speedy delivery necessary, the usual mode of assistance is by forceps. Should judicious efforts with forceps fail, symphyseotomy will enable them to succeed. Exceptionally, as when head is very large and is arrested high up, or above the brim, and cannot be made to enter it by manual pressure, even in these slighter cases of flattening, version is preferable to forceps, especially when membranes are unbroken, and os uteri not sufficiently dilated to render forceps advisable.

In the second degree of simple flattening (conjugate between $3\frac{1}{2}$ and $2\frac{3}{4}$ inches), we can expect neither spontaneous delivery nor successful forceps delivery, unless the child be *unusually* small. Version is here the most usual mode of proceeding. By turning we bring the narrow part of the head (its bi-temporal diameter, $3\frac{1}{4}$ inches) to engage *first* in the contracted conjugate, which the wider *dome* of the skull could *not* do (see Figs. 194, 195, page 390), while *after* turning the skull is further narrowed laterally by pressure between the pelvic walls, as shown in Fig. 195. Moreover, *after* turning manual abdominal pressure from above may be conjoined

with traction on the child's body from below. In cases where the conjugate diameter approaches the lower figure of $2\frac{1}{4}$ inches, symphyseotomy may precede version unless the head be undersized. The chief object of version, here, is to deliver a *living* child. If the infant die during version our design has failed. Hence, should it be dead already, or very likely to die during version, perforation would be preferable. If a living child cannot pass, it is useless to wait for its death before we perforate. After turning, craniotomy may still be

FIG. 194.

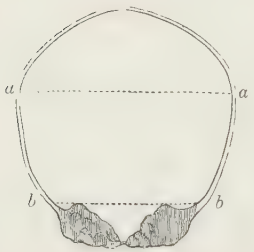


FIG. 195.

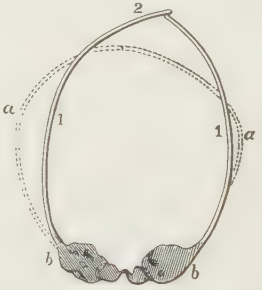


FIG. 194.—Section of fœtal skull, showing base narrower than dome. *aa*, biparietal diameter; *bb*, bi-temporal diameter.

FIG. 195.—Further narrowing of cranium by pressure after turning. *aa*, outline of skull *before* version; *b* 1 2, outline *after* turning.

required for the after-coming head, but could this have been anticipated perforation *before* version would have been better. Many obstetricians do not sanction version at full term when the conjugate is less than 3 inches. Furthermore, should the head have passed the os uteri, or have descended into the pelvic cavity, or if it require force to lift it back above the brim, or should the uterus be retracted above it (putting the vagina on the stretch), or emptied of liquor amnii and tightly grasping the child's body with imminent danger of rupture; under any of these circumstances version becomes extremely hazardous, and perforation may be preferable; though before this last, a tentative application of forceps is perhaps barely justifiable, for the child's sake, if it be yet alive. Perforation may also be avoided by resorting to symphyseotomy in these cases before attempting version. Subjecting the mother to

the dangers of an abdominal section for the sake of the child cannot in these cases be favorably considered, although such a course has been advised by some recent authorities.

In the third degree of flattening (conjugate of brim between $2\frac{3}{4}$ and $1\frac{3}{4}$ inches), forceps and version are out of the question (we still speak of full-term cases). The choice here is between perforation and some form of abdominal section. Should the child be alive, and if it have not been injured by delay or by futile attempts to deliver in other ways, and provided the general condition of the mother, her hygienic surroundings, her capacity to secure skilled attendants, etc., be such as to lend substantial hope of her surviving the abdominal section, this operation would be justifiable—the consent of herself and relatives thereto having been previously obtained. Under opposite circumstances, craniotomy. It must, however, be remembered that contraction of the conjugate below $2\frac{1}{2}$ inches seldom occurs without either *general* contraction, or narrowing of the *transverse* diameter, which must materially influence our mode of proceeding.

When the conjugate of brim is shorter than $1\frac{3}{4}$ inches, the difficulties and dangers of craniotomy are, beyond all question, greater than those of abdominal section.

In a *generally contracted* pelvis, a *living*, full-term child can scarcely be delivered through the vagina, either by forceps or version, unless the conjugate measures at least $3\frac{1}{4}$ inches. With slighter degrees of such contraction, forceps or version may succeed. When the conjugate is 2 inches, but with a transverse of less than 3 inches, Cæsarean section is almost a matter of necessity; and when there is general contraction to the extent of 1 inch in each direction, the abdominal section would *probably* be better than craniotomy.

Should the head, in any case, have descended into the pelvic cavity, or have reached the lower strait, craniotomy would, of course, be less objectionable.

In performing version in extreme *justo-minor* cases, difficulty with the *after-coming head* is often very great. When the general reduction is one inch in *all* the diameters, we can scarcely deliver it even with the perforator and cephalotribe.

Once again, be it distinctly understood that measurements of the pelvis *alone* cannot be taken as guides for practice. In selecting the method of operating, *all* the circumstances of the case must receive due consideration. Exceptional cases re-

corded in books, of successful delivery through very small pelves, by exceptionally skilled operators, are unique *possibilities* that cannot be taken as guides for general practice.

In cases where the pelvis will not admit the delivery of a living *full-term* child, the birth of a living infant may still be possible by the induction of premature labor, which is considered in the next chapter.

CHAPTER XXIII.

THE INDUCTION OF PREMATURE LABOR.

By the end of the twenty-eighth week of pregnancy the child is sufficiently developed to be capable of extra-uterine life. Delivery between the twenty-eighth week and full term is called "premature labor;" *before* the twenty-eighth week, "abortion."

Cases in which it is Proper to Induce Premature Labor.—1. In pelvic deformity where there is sufficient space for a seven months' child to be delivered without injury. The object is twofold: (*a*) to save the child's life by obviating the necessity for craniotomy; (*b*) to spare the mother the dangers of craniotomy, Cæsarean section, symphyseotomy, or other operations that might be required if the pregnancy went to full term. 2. In cases where, in previous labors, the head of the child at full term has been prematurely ossified, or unusually large, so that labor has been difficult and dangerous, even though the pelvis were normal. The period of delivery need only be two or three weeks before "term" in these cases. 3. In cases where the children of previous pregnancies have died *in utero* during the later weeks of gestation from disease (fatty, calcareous, or amyloid degeneration, etc.) of the placenta. 4. In conditions where the continuance of pregnancy seriously endangers the mother's life, such as: excessive vomiting; albuminuria; uræmic convulsions, or paralysis; chorea; mania; organic disease of the heart, lungs, liver, bloodvessels, etc., threatening fatal disturbance of the respiration, circula-

tion, and other vital functions; irreducible displacements of uterus; placenta prævia with hemorrhage; and in dangerous pressure upon neighboring organs from over-distention of uterus, due to dropsy of amnion, tumors, multiple pregnancy, etc.

Induction of Premature Labor in Pelvic Deformity.—In *flat* pelves (the more common rachitic deformity) the degree of conjugate contraction in which it is proper to induce premature delivery, when it is designed to save the child's life, is practically limited to between $2\frac{1}{2}$ and $3\frac{1}{2}$ inches.

A child, at the end of the seventh lunar month (28th week), may be delivered alive through a conjugate diameter of $2\frac{1}{2}$ inches.

One at the end of the eighth lunar month (32d week) through 3 inches—possibly, through $2\frac{3}{4}$.

One at the end of the ninth lunar month (36th week) through $3\frac{1}{2}$ inches.

When the measurement is over $3\frac{1}{2}$ inches the labor may be left till full term (40th week).

In *generally contracted* pelves, when *all* diameters are shortened, the conjugate must measure at least *one-quarter of an inch longer* than the figures given above, in order to allow the same rules of operating to be followed.

Owing to the difficulty of determining *exact* size of the head and pelvis, the more precise rules given in text-books are practically useless. Furthermore, it is not always easy to ascertain with *precision* the duration of pregnancy. The selection of any week intermediate of the periods above noted must be left to the judgment of the obstetrician and decided by the circumstances of each case. The most usual time for bringing on labor, all things considered, is between the thirty-second and thirty-fourth week.

In any case with a conjugate of $2\frac{3}{4}$ inches chances of saving the child's life are exceedingly small; but, as craniotomy, symphyseotomy, and abdominal section are the only other means available, the attempt ought to be made, delivery being aided, if necessary, by version, or by small forceps—a diminutive instrument having been constructed for this purpose.

When the conjugate diameter measures *less* than $2\frac{1}{2}$ inches, *abortion* should be induced as soon as possible after the diag-

nosis of pregnancy is certain. When the conjugate diameter measures 1½ inches, induction of abortion must not be postponed later than the beginning of the twenty-first week; when 1¼, not later than the beginning of the seventeenth week; and when only 1 inch, not later than fourteen weeks. If, however, the woman (being childless, or for other reasons) prefer to risk the dangers of a cutting abdominal operation, and there are no special circumstances rendering such a course peculiarly inadvisable, the case may be allowed to go to term, and the child then extracted promptly by section through the abdomen.

Methods of Inducing Labor early in Pregnancy before the Child is Viable.—Two methods of inducing abortion in common use during the early months are: 1. *Dilatation of the os and cervix uteri;* 2. *Puncture of the amniotic sac.*

1. *Dilatation of Cervix.*—The vagina and vulva, the hands and instruments of the operator, having been rendered aseptic, a tupolo or laminaria tent (previously sterilized)[1] is passed well up into the cervix with a pair of dressing forceps until its upper end penetrate through the internal os; it is kept in place by a tampon of iodoform gauze placed below the external os in the vagina, and there allowed to remain. In a few hours the tent absorbs moisture, *swells,* and thus dilates the cervix sufficiently to invoke uterine contractions (pains).

This method secures preservation of the bag of waters, which aids subsequent greater dilatation of the os and cervix uteri, and favors discharge of entire ovum—fœtus, placenta, and membranes—all at one time; and also tends to minimize the amount of hemorrhage.

2. *Puncture of the Amniotic Sac.*—The sac is ruptured by introducing a uterine sound, or some other similar instrument, into the cavity of the womb, and turning it about therein until the liquor amnii escape. The method is more often used criminally than for beneficent purposes. It is perhaps the worst of all methods, and must certainly never be employed late in pregnancy when it is designed to save the child's life, for discharge of the "waters" subjects the soft and immature fœtus to fatal compression by contraction of the uterine walls during delivery.

[1] *Sponge* tents are no longer used; it is impossible to sterilize them thoroughly.

Surgical Method.—It has been recently recommended to treat the ovum as if it were a morbid growth and remove the contents of the uterus by a surgical operation.

After *thorough disinfection* of the abdomen, vagina, and external genitalia, as well as of the hands and instruments of the operator, the patient is anæsthetized. A speculum is introduced; the anterior lip of the uterus steadied by a vulsellum forceps, while with a steel branched dilator (Goodell's) the os and cervix are slowly dilated to the extent of one or even two inches. The whole hand is then passed into the *vagina*, while the index finger slowly goes into the *uterus* until reaching the fundus, which last is pushed, by abdominal pressure, deeply down into the pelvic cavity. The entire ovum—membranes and everything—is then peeled or scraped from the uterine wall with the finger and extracted. In case the womb cannot be sufficiently depressed for the finger to reach the fundus, a long curette may be used to *separate* the ovum, and its extraction accomplished by the finger or ovum-forceps afterward. Ergot and compression may be necessary to control hemorrhage. Finally, the emptied womb is thoroughly washed out with a 1 to 5000 solution of bichloride of mercury, or with a 3 per cent. solution of creolin, after which a drain of sterilized gauze is passed to the fundus, and the proceeding is finished in short order. The gauze to be removed in sixty hours.

When the cervix is rigid and refuses to yield to the finger or steel branched dilator, the cervical canal (having been dilated as far as practicable by these methods) is stuffed with sterilized gauze, which after six or eight hours so far softens the tissues of the cervix as to allow of completing the required dilatation with the finger or instrument, when the operation is proceeded with as before described. While this method comports with the reigning surgical bias of the age, there are no proofs as yet that it is better than other antiseptic modes of managing abortion cases.

Best Method of Inducing Premature Labor when it is designed to Save the Child's Life.—After thorough asepsis of vagina, vulva, instruments, etc., pass into the uterus between its wall and the fœtal membranes—with great care and gentleness, to avoid rupture of sac and disturbance of placenta—an elastic urethral bougie (more easily rendered aseptic

than a hollow catheter) to a length of 7 or 8 inches within the os. Let it remain there (kept in place by a vaginal tampon of iodoform gauze) as a foreign body to invoke uterine contraction. In introducing the bougie the woman should be placed on her left side in the latero-prone position, with hips near the edge of the bed. A Sims's speculum is used; the cervix steadied by a tenaculum or vulsellum forceps in the anterior lip, while the bougie is passed up and guided into the os uteri; then let one finger follow it up to the internal os and deflect the point to one side, so as to avoid injuring the bag of waters. Thus guided by the finger of one hand, it is pushed

FIG. 196.



Barnes's bag for dilating the cervix.

up with the other. With the os uteri of a primipara it may be necessary to dilate it with the steel branched dilator, or with sea-tangle tents, before inserting the bougie. Instead of using a speculum, in the Sims position, the woman may remain on her back, and the bougie be passed up, grasped in a long pair of uterine dressing—or polypus—forceps, and guided in by the fingers as just described. If, in twenty-four hours, no effect be produced (which rarely happens), take it out, and again introduce it in a somewhat different direction, and leave it as before. Uterine contractions eventually occur, when the instrument is removed, and, if the pains increase in strength, the case may be left to nature.

If the contractions be only feeble and do not increase in strength and frequency, accelerate both *them* and dilatation

FIG. 197.



Dilator and forceps of Champetier de Ribes.

of the os, by introducing elastic dilators (Barnes's water-bags), first a small one, afterward larger sizes, into the cervix.

No other measures will *generally* be required. One of Barnes's water-bags, with its attached tube (usually a foot in length) removed, is shown in Fig. 196, page 396. The bag is introduced (the woman having been placed on her back, her lower limbs flexed, and hips near edge of bed) by means of a uterine sound, the end of which is inserted into the little pocket fixed to the bag near its upper end, or it may be folded and grasped by a pair of dressing forceps, passed just into the cervix, and pushed up further with the fingers. It is next filled with water (not with air) by a Davidson's syringe, the capacity of the bag having been previously learned, so that it be not distended to bursting. A string tied tightly around the tube retains the water.

A modified dilator, invented by Champetier de Ribes, differs from that of Barnes in being larger (3½ inches in diameter at the base), of conical shape, and made of *in*elastic water-proof silk. It is introduced with a special curved forceps, as shown in Fig. 197, page 397.

It remains *in situ* until expelled by the pains, when dilatation will be sufficiently complete to allow of delivery. In cases of pelvic narrowing this dilator must not be distended to its full capacity, but only so far as will allow it to pass easily through the contracted canal.

If, when the os is *well dilated* with the larger bags, uterine contraction be still delayed, the membranes *may* be ruptured, but *then* delivery must be *hastened*, usually by getting down one foot by the Braxton-Hicks method of version, in order to save the child's life.

Other Methods: The Vaginal Douche.—Place the woman upon a bed, her hips near the edge of it and resting on a rubber cloth, in which is arranged a gutter to guide the returning fluid into a vessel on the floor. By means of a fountain-syringe, Davidson's syringe, or a rubber tube connected with an elevated vessel, direct a stream of warm water *against* the cervix uteri, continuously, for fifteen minutes, three times a day, at intervals of six hours. The nozzle of the syringe must go *against* the *neck*, never *into* the *mouth* of the womb. Temperature of the water about 100° F. From four to twelve, or more, injections may be necessary. The woman need not keep her bed before labor begins. A modification of the vaginal injection is known as Cohen's method.

Cohen's Method.—This consists in passing an elastic catheter between the membranes and uterine walls, and injecting warm water, slowly, in quantity of seven or eight ounces, *into the uterus*, preferably near the fundus, until the patient feel some distention. Labor comes on much more certainly and rapidly than after the vaginal douche; *but* both these methods have caused sudden death, and Dr. Barnes, with whom many other practitioners agree, avows "that the douche, whether vaginal or intra-uterine, ought to be absolutely condemned as a means of inducing labor."

The Vaginal Tampon.—Distending the vagina with a tampon, or rubber bag blown up with air or water through a stopcock (the *colpeurynter* of Braun), is another means of exciting uterine contraction, and a comparatively harmless one when carefully used, but withal painful, and uncertain in efficacy. The best tampon is a continuous strip of iodoform gauze, thoroughly packed round the cervix and below it, till the vagina be full, the woman being in the knee-chest position or in Sims' posture. It should be removed in twenty-four hours, and if requisite repeated after washing out vagina with antiseptic solution.

Uterine Injections of Sterilized Glycerin.—A recent method of inducing labor consists of injecting between the uterine wall and bag of waters from one to three ounces of *sterilized glycerin*. It acts by producing a rapid exosmosis of fluid from the amniotic sac or from the uterine wall, with consequent separation of the membranes and production of labor pains. The glycerin is sterilized by boiling. After proper antiseptic precautions the woman is placed in a knee-chest or latero-prone position; a rubber tube or elastic catheter is passed to the fundus, through which the glycerin is introduced either by gravitation from a funnel or by a syringe, care being taken to exclude air. The tube is withdrawn, the vagina packed with iodoform gauze, and the patient kept at rest for several hours. In some cases labor pains come on within an hour; and if not within four or five hours, the injection may be repeated. Half an ounce has been sufficient in some instances. This method has not yet been sufficiently used to allow of a positive decision as to its merit. By some it is considered *un*certain, and has been supposed to produce nephritis.

The use of ergot and other oxytocics; the injection of carbonic acid gas into the vagina; the induction of uterine contraction by electricity, galvanism, abdominal frictions, irritation of the mammary glands, have in turn all been resorted to for bringing on premature labor, but cannot now be recommended.

Whatever method is used, the main purpose of the operation, viz., that of saving the child's life, must be kept constantly in view, and since delay after rupture of the membranes, if prolonged, is likely to destroy the child, it should be delivered either by forceps or version as soon as dilatation of the os uteri and other existing conditions render such a proceeding safely practicable.

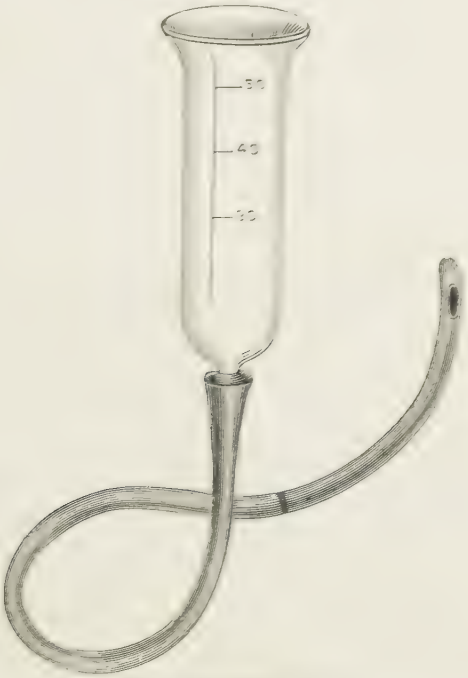
Treatment of Premature Infants after Birth.—The two great *desiderata* are warmth and food, to which a third might be added, viz., rest. Lay the child upon a mass of, and cover it over with, cotton-wool. Keep it near the fire, protected from changes of temperature. Handle it carefully in washing, the water used being as warm as 100° F. The mother's milk—given with a spoon if the child be too feeble to suck, or dropped in the mouth with an "eye-dropper"—must be administered at frequent intervals, every hour, and without a long fast during the night. Should the mother not have sufficient milk during first day or two, it must be obtained from a wet nurse, or artificial food be substituted.

The child's skin is extremely delicate; hence it should have a daily bath (100° F.) not exceeding three or four minutes in duration, and its napkins must be changed promptly, as soon as soiled by discharges from the bladder or bowel.

To maintain premature children at a uniform and elevated temperature, "incubators" have been employed. These consist of chambers with sufficient breathing space, in which the child lies, and the air of which is kept at the desired temperature (86° to 90° F.) by artificial heat, supplied by another chamber having hollow double walls containing hot water, surrounding the interior compartment containing the infant. The lid is of glass through which the child may be seen, and the apparatus contains contrivances for regulating temperature and ventilation at will. "Tarnier's incubator" and the "apparatus of Credé" are now used in many maternity hospitals. An incubator may be improvised by placing bottles

of hot water beneath and around the cotton-wool contained in a box or basket in which the child lies, the bottles being changed frequently. The success of this incubation-process requires the constant attention of a nurse, and largely depends upon the weight and degree of prematurity of the child. Children weighing less than three pounds seldom survive; of those weighing four or five pounds many are saved.

FIG. 196.



Tube and funnel for gavage.

The process of "*gavage*"—artificial introduction of food into the stomach—has also been employed in infants too young and feeble to nurse, with apparent advantage. A soft rubber catheter with a small glass funnel at one end (see Fig. 196) is moistened, and the free end passed to the back of the

tongue, which provokes a reflex act of swallowing, when the tube is quickly pushed on down into the stomach; now two, three, or more teaspoonfuls (according to age) of the mother's milk, previously made ready, are poured into the funnel, and as soon as it disappears by gravitation the tube is quickly withdrawn—there must be no waiting, or the child will vomit. With practice and expertness the whole proceeding may be done in fifteen seconds. The child rests on the nurse's lap with its head slightly raised during the operation.

CHAPTER XXIV.

PLACENTA PRÆVIA—HEMORRHAGE BEFORE AND DURING LABOR.

PLACENTA PRÆVIA consists in implantation of the placenta abnormally near to, or more or less over, the internal os uteri. There are three varieties: (1) The border of the placental disk may be near the margin of the os without overlapping it, hence called "*marginal*;" (2) the placenta may be partially or (3) completely over the os internum, hence, respectively, "*partial*" or "*complete*" cases.

Causes.—Not certainly known. Probable explanations are: Displacement of ovum from its normal position and lodgment lower down, as after arrest of threatened abortion; abnormally low position of orifices of Fallopian tubes; large relaxed uteri of multiparous women, in which folds of decidua vera do not retain ovule near fundus when it first enters the womb; hence the undoubted greater frequency of placenta prævia in multiparæ.

Consequences of Placenta Prævia.—1. Liability to premature labor; only about one-third of the cases reach full term; 2. Tendency to malpresentation; 3. Fearful hemorrhage, generally coming on during the last twelve weeks of pregnancy, or when labor begins; the bleeding being earlier and greater according to the greater degree of placental encroachment over the os; in the marginal cases sometimes not until "term;" in complete ones, exceptionally, *before* the last

twelve weeks; 4. Death of the child, due to asphyxia, to premature delivery, or to hemorrhage, or to compression of cord during version, or to prolapse of cord and its insertion near margin of placenta; 5. Liability to post-partal hemorrhage; 6. Danger of septic infection; 7. Morbid adhesion of placenta; in premature cases the tissue-changes in the utero-placental junction, normally preparing for separation at full term, have not yet taken place.

Symptoms and Diagnosis.—*Before labor* sets in, placenta prævia is generally unsuspected until the sudden occurrence of hemorrhage, which begins *without any known cause*, sometimes even at night during sleep, or while urinating in a chamber vessel. It may stop and again recur. The quantity varies with the amount of placental *separation* (which always precedes the bleeding). First attacks usually moderate; exceptionally, quarts of blood are lost, and death follows one or two recurrences; such cases are usually "*complete*" ones. The quantity is apt to increase with each recurrence.

During labor the bleeding begins early with commencing dilatation of the os. It may, in marginal cases, be arrested by rupture of membranes and consequent compression of bleeding surface by the presenting head. Labor pains usually feeble, and dilatation slow. To these symptoms must be added those due to blood-loss: syncope, restlessness, feeble pulse, cold extremities, vertigo, headache, etc. In fatal cases convulsions often precede death.

The *diagnosis*—clearly suspected from history and symptoms—is confirmed by vaginal examination, the irregularly granular spongy texture of the placenta being easily recognized by the finger passed into the os. In some primiparæ passing the finger to or through the internal os may be difficult or impossible; then, however, one side of the lower segment of the uterus may be felt, through the vagina, to be *boggy, soft,* and *enlarged* where the placenta is attached; and the pulsation of arteries may be felt in it. A stethoscope applied to cervix may reveal loud placental murmur. The sign ballottement is obscured. Diagnosis cannot be *positive* until the placenta is actually touched and recognized by the examining finger. During the first half of pregnancy a certain diagnosis is *im*possible. By skilful hands the spongy cushion of the placenta may be recognized (chiefly in head presentations) by *abdominal palpation.* A region of the hard

globe of the head feels obscured by the placental mass, while the part not covered by the placenta retains its usual hardness This can only occur when the placenta is *not* situated *posteriorly*.

Prognosis.—Extremely grave. Statistical estimates give maternal mortality from 25 to 30 or even 40 per cent. As statistics cover a long period of time, necessarily so from placenta prævia not occurring more frequently than once in about 1000 labors, there is reason to know that the above rate of mortality has been reduced by *recent* improvements in treatment. The outlook is worse in proportion to the degree in which placenta overlaps the os. Two out of three children are born dead, and still others succumb soon after birth.

Treatment.—The main principle of treatment is *delivery:* there is no safety for the woman until the uterus be emptied. It was formerly the custom, and still is with some obstetricians, when hemorrhage occurs before the twenty-eighth week of pregnancy, to wait, only using palliative measures to check hemorrhage, until the period of viability, before attempting to deliver. This is wrong and always unsafe. The child will seldom be saved by temporizing, and the mother often dies with the recurrence of hemorrhage, the bleeding coming on suddenly, as it is apt to do, in the absence of the physician. The best rule is to *deliver as soon as practicable after the first occurrence of hemorrhage, whether the child be viable or not.*

The usual *mode* of delivery is *podalic version*, preferably by the combined internal and external manipulation—the so-called "bipolar" method—and subsequent traction on the feet.

While this proceeding, from certain circumstances to be presently mentioned, is more frequently employed than others, it is not *always* advisable or possible. In selecting any method for a special case, the particular conditions present must be first fully considered. One of these conditions, of the greatest importance, is the degree of *dilatation*, and *dilatability, of the os and cervix uteri*. If the os be not sufficiently open to admit one or two fingers, *no* method of immediate delivery is possible. Our main purpose now is to *control hemorrhage* while waiting for the os uteri to dilate, and also to hasten the dilatation.

The *tampon* of iodoform gauze, first plugging the cervix uteri, and then the whole vaginal canal, provided it be

securely applied, will *certainly* stop the bleeding temporarily; it also promotes dilatation and increases force of pains; or, if pains be absent, from labor not having begun, it will inaugurate them. It should be removed in four hours, when the vagina is to be washed out with an antiseptic solution, and a Barnes's elastic water-bag introduced into the os uteri (see page 398), which further dilates the cervix and increases labor pains. When the os will not admit the gauze tampon—as may happen in premature cases of primiparæ—*tents* may be first used for dilatation, or the dilator of Hegar may be employed. When these are not at hand, and cannot be obtained without great delay, the *finger* may be used to stretch open and dilate the os and cervix uteri.

As soon as the os uteri is sufficiently dilated to admit one or two fingers, pass the whole hand into the vagina, insert one or two fingers through the os uteri, and get down one foot by Hicks's bipolar version (described fully in Chapter XIX., pages 316-320). Pull down, successively, the leg, thigh, and breech, which fill the os and cervix uteri, and act as a tampon to stop bleeding. Do *not* at once extract child, but let it come unaided, or assist occasionally, during pains, by gentle traction, so as to deliver in about an hour. With the child's leg for a tampon the disagreeable cotton plug may be dispensed with. If the placenta be in the way, perforate the membranes at its margin, or at any point where it may be separated. Failing in this, plunge the finger through the placenta (the organ is usually *thinner* than in normal cases), and bring down the leg through the opening thus made. Of 178 cases treated in this manner by Drs. Hofmeier, Behm, and Lomer, in the Berlin Hospital, the maternal mortality was only *four* per cent., and the infant mortality sixty per cent.—a remarkably good result.

Besides the means already noted to stop bleeding while waiting for dilatation, there remains to be considered—

Partial Digital Separation of the Placenta (Barnes's method), which consists in passing the *hand* into the *vagina*, and one or two *fingers* as far as they will reach into the *uterus*. The fingers, then insinuated between the placenta and the uterine wall, are swept around in a circle so as to *complete* the separation of *that part* of the placenta attached near the cervix, and whose *in*complete detachment keeps the bleeding vessels open. It is often followed by retraction of the cervix and cessation

of the hemorrhage, and is especially serviceable when the placenta is placed *entirely* over the os. Rapid expansion of the cervix with Barnes's dilators and delivery by version may follow, if desired ; or, there being no necessity for active interference (*i. e.*, no more bleeding) the case may complete itself without further assistance.

Nearly allied to Barnes's method is that of *Cohen* and *Davis*, viz. : Pass one or two fingers in between the placenta and uterine wall, on that side where the separation has begun, or where the attachment is least extensive ; complete the separation on this side, and then let the fingers hook down the border of this loosened flap of placenta and pack it closely against the other side of the cervix. Then rupture membranes, give ergot, and hasten delivery. Should pains be strong with the head presenting, the latter may engage within the os, and, by its pressure against that side from which the placental flap was removed, plug the vessels and stop bleeding. Should the pains *not* be strong enough to force down the head in this manner, a foot may be brought down by version, and thus the leg and breech be made to act as a plug, as in the Berlin proceeding before mentioned. Even though the presenting part do not enter and act as a plug after this one sided artificial separation of the placenta, the bleeding vessels have a chance to retract and close their orifices, for they are no longer on the stretch ; moreover, the transverse bridge of placenta which impedes dilatation, being now free on one side, no longer impedes it in this way.

In cases where, besides being undilated, the os is rigid and the cervix long and rigid also, we again resort to the vaginal tampon and Barnes's dilators until the cervical tissues become sufficiently open and soft to admit the finger for the execution of version or partial separation as before explained.

Bipolar version can be done when the os is as small as a silver *half*-dollar, or even less, for the tissues of the cervix, in most cases, are unusually dilatable in placenta prævia, and in many cases the child is small, being premature. High authorities advise to proceed boldly with *delivery* when the *external* os is the size of a silver half-dollar, for the cervix and *internal* os are still larger and stretch with great facility.

In transverse presentations—not infrequently associated with placenta prævia—podalic version by external or bipolar

manipulation should be accomplished before membranes are ruptured or ergot given.

In cases with hemorrhage, before labor begins, the dilators and tampon, used to stop bleeding, will excite pains and bring on labor.

In a few cases (usually multiparæ at or near full term) when the os is *pretty well dilated*, and the placenta prævia is only partial, and pains are strong, simple rupture of the membranes may be all that is necessary to stop hemorrhage, and the labor will proceed by itself, or (in head presentation) be expedited, if necessary, by forceps. Should the pains be inefficient, ergot may be given, and manual pressure made upon the upper end of the fœtal ovoid over the fundus uteri, or the hand may grasp the head of the child low down, over the lower part of the abdomen, and thus assist its descent into the pelvis.

The use of ergot in placenta prævia early in labor is *not* objectionable, as in ordinary labors, because in most cases the child is *small*, being *premature*. Before using it, however, it should always be ascertained that there exists no *other* mechanical obstruction, such as transverse presentation, pelvic narrowing, tumors, etc. Should the pregnancy be at term and the child *full sized*, the use of ergot is not so safe, yet the risk in using it even here may be less than the dangers of delay from inefficient pains.

Simpson's method of treating placenta prævia consisted in completely separating and extracting the placenta, trusting to powerful uterine contraction for subsequent rapid delivery of the child—a trust so seldom realized in practice that Simpson's plan scarcely allows a chance for the child's life. Complete separation of the placenta, however, will often arrest the hemorrhage, and may, therefore, be of use when the child is dead, or not viable, or pretty sure to die from prematurity of the labor; or when great exhaustion on the part of the woman, and the state of her pelvis and soft parts, contra-indicate delivery by version.

Anæmia, syncope, or collapse, from loss of blood, will require stimulants, etc., as more particularly described under post-partal hemorrhage, in the next chapter.

No precise rules can be laid down for the exact treatment of placenta prævia in every case. The main difficulties, dangers, and principles of management having been learned and the several methods of treatment enumerated, the rest must

depend upon the judgment, skill, and self-possession of the accoucheur.

After delivery ergot must be given, and for several days, to prevent post-partal hemorrhage; and a two per cent. solution of creolin should be injected into the vagina twice a day to prevent septic infection. Should bleeding recur, from the low segment of the uterus, when the body of the organ is well contracted, the bleeding surface may be swabbed with a solution of styptic iron, through a speculum, or tamponed with iodoform gauze.

Hemorrhage before Delivery, but without Placenta Prævia.—Partial separation of the placenta, with hemorrhage, may occur during the latter months of pregnancy or after labor has begun, when the organ is *normally situated*. It may result from blows, falls, or other mechanical violence; pathological degeneration of the placenta or uteroplacental junction; profound anæmia, albuminuria, and multiparity with frequent child-bearing are probable predisposing causes. It sometimes results from nephritis during pregnancy, as well as from other acute diseases, viz., variola, scarlatina, typhoid fever, and acute yellow atrophy of the liver. Seldom occurs in primiparæ.

Symptoms.—Flow of blood from the uterus; *pure* blood when it comes from between uterine wall and unbroken membranes; blood *mixed* with liquor amnii when the membranes are broken. Hemorrhage (coupled with alarming syncope), distention and irregular bulging of the uterine wall; labor pains may be absent altogether, or, if present, are irregular, feeble, and inefficient. The collapse, pain, etc., occurring during labor have been mistaken for rupture of the uterus. The latter, however, will be accompanied with recession or mobility of the presenting part, and escape of the child, wholly or partially, into the abdominal cavity. Rupture is usually preceded by *violent* uterine contractions.

Prognosis.—Extremely grave, especially in concealed cases, where the diagnosis is, or may be, uncertain, and efficient treatment postponed. The maternal death-rate is, roughly, about 50 per cent.; the infant mortality, 95 per cent. Luckily this accident is not a common occurrence, though it is, perhaps, sometimes undiscovered.

Treatment.—Stimulate *uterine contraction* by every known

means. Rupture the membranes at once; give ergot or ergotin hypodermically; apply uterine compression by firm abdominal binder.

If os be dilated, deliver by version, or, if during labor the head be low enough, by forceps. If the os be *not* dilated, dilate it with Barnes's bags until sufficiently open to admit of version, extraction of the child being assisted by manual abdominal pressure.

CHAPTER XXV.

POST-PARTAL HEMORRHAGE—"FLOODING."

Hemorrhage after delivery of the *child*, and either before or after delivery of the *placenta*, is a most dangerous complication, sometimes causing death in a few minutes, especially when unprepared for and irresolutely managed. Hence, necessity of fixed principles and decided remedies, used without hesitation, in the hour of need. Dr. Gooch well said: "No physician should have the assurance or hardihood to cross the threshold of a lying-in chamber who is not thoroughly conversant with the remedies for flooding." It consists of bleeding from the open mouths of uterine blood channels from which the placenta has, wholly or in part, been separated.

Causes.—Correctly appreciating the causes of flooding permits *prevention*, which is better than cure. Excluding, for the present, the rarer cases in which bleeding occurs from laceration of the uterus, vagina, and vulva, the one condition, above all others, that leads to flooding is *deficient uterine contraction*—sometimes a *total* want of it—*inertia uteri*. Why should the womb remain inert after the child is born? Its muscular walls may be worn out by a *long labor;* or partially paralyzed, like an overfull bladder, from previous *overdistention* due to amniotic dropsy, or pleural pregnancy, etc. Too *rapid labor*, as by injudicious haste in artificial delivery, or from abnormally enlarged pelvis, especially when preceded by overdistention of the womb, produces it. The uterine muscular wall may be congenitally *deficient in development* (as in

precocious mothers), or *malformed*, or bound down on the outside by *peritoneal adhesions*, or *texturally degenerated* from previous inflammation, or *numerous and quickly successive labors*, as in elderly women. Weak uterine muscles may occur from *general weakness of the woman*, due to constitutional disease, severe previous illness, exhausting discharges, heat of climate, etc.

Distention of bladder or *rectum* causes *sympathetic* uterine inertia, as may also *violent mental emotion.*

Retention of placenta—whether from morbid adhesion, large size of the organ, or irregular ("hour-glass") contraction of the womb—*mechanically* prevents close contractile approximation of the uterine walls. In the case of morbid placental adhesion, the *partially separated* blood-channels are kept open and *cannot retract* to prevent bleeding, as they normally should do. It is liable to occur, as already stated, in placenta prævia. A short or coiled funis may lead to separation of the placenta before birth of the child. The placenta follows the delivery of the child almost at once, and with it comes, sometimes, a profuse hemorrhage—blood that had accumulated in the uterus between the time of placental separation and delivery. Occasionally fibroid tumor of the uterus, when seated near placental site, will produce hemorrhage.

Those who have flooded in previous labors are apt to flood again. This is observed in plethoric women, subject to profuse menstruation, and is further explicable by existence of conditions as to pelvis, womb, etc., previously mentioned, which are permanent and irremovable.

Further causes are: conditions which interfere with formation of, or which tend to move and displace, coagula in the mouths of the bleeding vessels. The blood-changes of profound albuminuria, and wasting diseases, possibly the so-called "hemorrhagic diathesis," may retard formation of coagula; and formed or half-formed clots may be displaced by strong arterial tension and pulsation, or by the patient suddenly rising, "sneezing, coughing, laughing, vomiting," etc. (Lusk.)

On the whole, the one main cause is *deficient uterine contraction*. When a contracted womb continues to bleed there is probably laceration.

Symptoms.—Gushing of blood from the vagina, either immediately or some time after birth of the child, or still later after delivery of placenta. Quantity variable: moderate or fatal

—a trickle or a flood. Absence, partial or complete, of hard uterine globe on hypogastric palpation. The womb may be soft and greatly enlarged from accumulation of blood in its cavity, with little or no external flow ("concealed hemorrhage"). In either case there are symptoms of blood-loss: deathly pallor; cold extremities; feeble, frequent, thready, or imperceptible pulse; gaping, restlessness, dyspnœa, and hunger for air; thirst, and even hunger for food. In the worst cases syncope, loss of vision, convulsion, death.

Treatment. Preventive and Preparatory Measures. — The necessity of guarding against relaxation of the uterus and promoting uterine contraction during the third, and near the end of the second stage of labor—by manual pressure—has already been insisted upon as a precaution in every case. Prof. Lusk advises every obstetrician to prepare for flooding during second stage of labor—whether it be likely to occur or not—by providing beforehand a good-working Davidson syringe, ice in pieces the size of an egg, brandy, sulphuric ether, neutral perchloride of iron, carbolic acid, ergot, a solution of morphia, a can of iodoform gauze, a hypodermic syringe filled with fluid extract of ergot, or two grains of ergotin in solution, together with pitchers of hot and cold water, an empty basin, a fountain syringe, and a bed-pan, all placed within easy reach of the bedside; a preparation neither tedious nor troublesome, but which may save a life.[1]

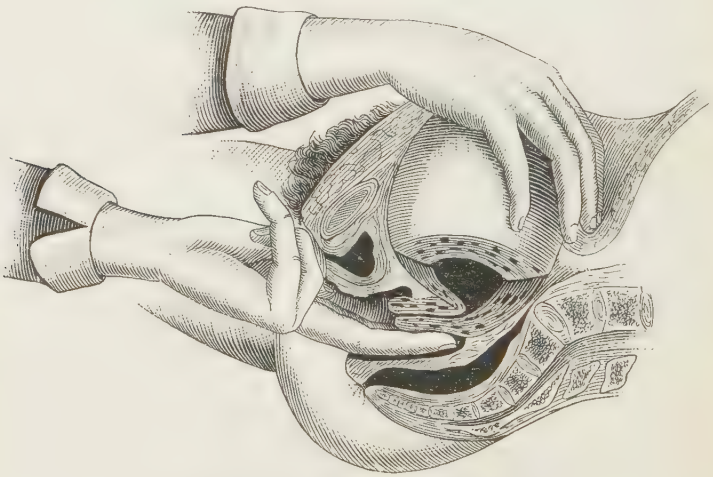
When the hemorrhage occurs, grasp the uterus, *without a moment's delay*, through the abdominal wall, and knead it with the finger-ends, to secure contraction, while an assistant injects, hypodermically, a drachm of fluid extract of ergot, or two grains of ergotin in a drachm of water into the outside of the thigh. Let the nurse give a dose of ergot by the mouth, and also put the child to the breast. With proper previous preparation and self-possession, all this can have been done within thirty seconds.

Should the womb not yet contract and the flooding continue, let one hand continue to grasp the fundus uteri on the outside, while the other (again without hesitation) is passed quickly, but gently, into the vagina and uterus. (The hands must, of

[1] It is to be hoped the recommendations of Dr. Lusk may contribute to lessen the frequency of the appalling deaths from flooding, many of which may be attributable to lack of previous preparation. It has long been the author's opinion, as already expressed on a former page, that some such preparation should be *required* of physicians by legal enactment.

course, be rendered *aseptically clean*.) Now the uterine wall is between the two hands, and may be pressed between them, while the outside one applies friction to the fundus. *If the placenta be undelivered*, it must be removed at once, either by grasping and squeezing the fundus firmly by the outside hand, or the hand inside grasps the placenta bodily, having previously separated any remaining adhesions, and gently withdraws it, the hand outside meanwhile compressing the uterus with sufficient firmness to squeeze its anterior and posterior

FIG. 199.



Bimanual compression producing anteflexion, etc.

walls together. *If the placenta be delivered* before the flooding, and large blood-clots occupy the cavity, these must be fearlessly removed, and the obstetrician's hand take their place. A special mode of grasping the uterus—bimanual manipulation—may be tried as follows: Press the finger-ends of the outside hand deep in between the umbilicus and uterus, so that the latter resting in the palm may be pushed down and forward against the pubes, while the other hand (or two fingers of it), passed high up along the posterior vaginal wall, presses the lower segment of the womb—in fact, its cervix—forward toward the symphysis pubis, thus by a sort of temporary ante-

flexion the canal of the neck is closed and no blood can come out, while the pressure above prevents enlargement of cavity and accumulation within. It also stimulates contraction. (See Fig. 199, page 412.)

A perfectly clean aseptic sponge, or preferably a similarly clean bit of rag or small pocket-handkerchief, saturated with spirit of turpentine, or whiskey, passed into the womb, and squeezed so that the spirit comes in contact with the uterine walls, are efficient stimuli to uterine contraction. A cloth containing pure chloroform, passed into the uterus and allowed to remain there for a time, has also been used successfully. The old—but well-tested—remedies, of a rolled gashed lemon and a sponge filled with vinegar, being introduced and squeezed while in the uterine cavity, have of late been objected to as being aseptically unclean. They are, however, powerful excitants of uterine contraction. The vinegar can be sterilized by boiling, and, in cases of emergency, it is usually obtainable in every household. A lemon can be rendered aseptic, on its exterior, by immersion in a bichloride solution, and that septic germs inhabit its interior structure is at least improbable and certainly not demonstrated.

One of the best internal methods for arresting this hemorrhage is irrigation of the uterine cavity with hot sterilized water (110° to 115° F.) by means of a Davidson or fountain syringe, care being taken that the nozzle of the instrument is free from germs and its tube completely emptied of air before being used; a bed-pan receives the returning water.

In every case the child, whether washed or not, may be put to the breast, by an assistant, in the hope that suction of the nipples will produce reflex uterine contraction.

Contraction may sometimes be induced by rolling a piece of ice on the abdomen over the fundus at intervals, or pouring cold water from a height upon it, or flapping it with a wet towel.

Of late years a safe and efficient method of arresting hemorrhage has been found in the uterine tampon of iodoform gauze, or of gauze soaked in a 3 per cent. creolin mixture. Remember, it is a tampon in the *uterus*, not in the vagina. The gauze is soaked in a 20 per cent. iodoform solution and sprinkled with iodoform powder. Three strips of gauze each 2 inches wide and 3 yards long are prepared. After disinfecting the vagina with a 2 per cent. creolin solution, or with

a 1 to 3000 solution of corrosive sublimate, the patient is placed crosswise on the edge of the bed, and the tampon introduced, by seizing the cervix uteri with the hooks of a volsella forceps and pulling it down to the vulva, while one end of the gauze strip is grasped by a pair of long uterine forceps and carried to the fundus, then the forceps are withdrawn and another and another fold of the strip introduced until the womb be filled. When the genital passage and vagina are large, so that there is plenty of room, the womb may be pushed down by pressure of the left hand over the fundus until the os become visible at the vulva, when two fingers of the right hand push up the gauze into the uterine cavity until it be full. The rough gauze is thought to produce irritation of the uterine muscles, and hence contraction. The tampon may remain twenty-four hours, when it is easily removed by traction on one end of the strip. The advocates of this method consider it so sure, safe, and simple that, instead of making it a last resort, they use it at once, if ergot and manual compression fail to arrest the bleeding.

Under no circumstances should a *vaginal* tampon be used. It would cause the uncontracted empty womb to fill up with blood, thus converting an external hemorrhage into an internal, "concealed" one, and enlarging instead of diminishing the uterine cavity.

As a last resort when other means fail, the uterine cavity may be injected, or simply swabbed out, with liq. ferri perchlor. (or liq. fer. persulph.) one part to five parts of water. This constringes the mouths of the bleeding vessels, coagulates the blood in them, and stimulates uterine contraction. The remedy is not without danger to life, but is justifiable when other means have failed. Tincture of iodine, one part to three of water, has been used in the same manner.

Dr. Barnes insists that the dangers of injecting uterus with styptic iron solution will be prevented if the following rules be followed in using it: (1) be sure that uterus is empty of placenta, blood, and clots; (2) compress body of uterus, during injection, with the hand; (3) have two basins ready, one containing hot water (with which womb is first washed out), and another containing the iron solution (which immediately follows the hot water). Inject seven or eight ounces of the iron solution, slowly and gently, all the time keeping up steady pressure on fundus uteri. Dr. Barnes's formulæ are as follows:

℞.—Solid ferric chloride, ℥j.
Water, ℥x.—M.

or

℞.—Liq. ferri perchlor. fortior (Ph. Br.), ℥jss.
Aquæ, ℥viiiss.—M.

He advises womb to be washed out daily with carbolic injections afterward, to prevent septicæmia.

Compression of the abdominal aorta has been employed with good result as a temporary measure in urgent cases. It cuts off the blood-supply to the flooding uterus, stimulates uterine contraction, and lessens risk of fatal syncope by keeping blood in the brain that would otherwise flow downward.

It has been recently recommended, particularly in cases "where the bleeding results from large arterial vessels that have undergone atheromatous degeneration," to open the abdomen and *remove the uterus* by supra-vaginal amputation: a method that few obstetricians in private practice would willingly undertake, and that still fewer women, exhausted by previous hemorrhage, would be able to survive.

Another recent suggestion is to invert the uterus completely through the vagina, encircle it near the neck with a rubber tube or bandage of iodoform gauze, and thus arrest bleeding. After six hours, the tube (or bandage) is removed, and, there being no recurrence of hemorrhage, the inverted uterus is replaced. Practice has not yet demonstrated the utility of this operation.

In every case when the bleeding has been arrested and good contraction of the uterus produced, the organ must be supported on the outside by firm and equable compression over the abdomen, in order to maintain its retraction and prevent recurrence of hemorrhage. A well-adjusted abdominal binder, with compresses over the top and sides of the uterus, should be carefully applied. Prof. Lusk suggests a sack partially filled with moistened sand or common salt as a reliable compress and easy to obtain. A small basin, padded inside with napkins, placed over the fundus, is another similar device.

In all cases it should be ascertained that inertia of the womb is not kept up by a full bladder or rectum.

To restore the circulation after hemorrhage has ceased, or to prevent impending fatal syncope during its continuance, stimulants, nutrients, and *opiates* are required. A drachm of brandy, whiskey, or sulphuric ether may be given hypoder-

mically, and repeated at required intervals; or strychnia gr. $\frac{1}{30}$, or nitro-glycerine gr. $\frac{1}{100}$; morphia hypodermically to promote cerebral congestion, and tincture of opium and brandy internally in full doses, together with strong beef *essence*, milk, etc., at short intervals. In feeding the patient, the smallest *quantity* —only a teaspoonful every one or two minutes—may be all the stomach will bear without vomiting; this to be increased as larger portions are tolerated. If, in spite of care, vomiting occur, opiates, stimulating and nutrient enemata, or hypodermic injections may be used, to the temporary exclusion of mouth-feeding. Admit plenty of fresh air from open windows. Remove all pillows, to keep the head low, and elevate the foot of the bed, thus promoting gravitation of blood to the brain and medulla. The head must not be raised from its dependent position, to give food or medicine, nor for any other purpose, for fear of syncope and *fatal heart-clot*, until reaction have taken place.

Compression of the brachial and femoral arteries—or binding the four extremities with Esmarch's bandages—like aortic compression—may keep enough blood in the brain, temporarily, to prevent death, while stimulants get time to act.

When death is so near at hand that respiration seems about to cease, flick the face, neck, and breast with a wet, cold napkin; it invokes additional inspirations, and is usually grateful to the patient.

When stimulants and the other measures mentioned fail to produce reaction, transfusion may save the patient. The transfusion of blood, or of fresh cow's milk, formerly used, have of late been superseded by the more easily available proceeding of infusing into the circulation a saline solution. As much as a quart of the following mixture may be slowly introduced into a vein:

℞.—Sodii chloridi, ʒjss.
Sodii bicarb., gr. xv.
Aq. destillat., Oij.—M.

Dr. Lusk uses a simple solution of common salt, five grains only to a pint of water. The fluid may be passed into a vein of the arm—usually the median cephalic—by means of an elevated funnel, or fountain syringe, from which depends a tube surmounted at its lower end by a small canula for penetrating the opened vein.

The following simple method of *arterial* infusion[1] has been successfully employed: The saline solution having been prepared and placed in a fountain syringe, the needle of an ordinary hypodermic syringe is slowly plunged into the tissues of the thigh until its point penetrates the femoral artery (indicated by the appearance of arterial blood in the needle), when the end of the rubber tube is fitted over the base of the needle and securely tied by an assistant, who then holds the needle immovably; or, in the absence of an assistant, the needle may be grasped by a pair of hæmostatic forceps, the handles of the latter being then fixed on the thigh with strips of adhesive plaster. The bag of the fountain syringe containing the solution may now be elevated six or seven feet above the level of the thigh, when the fluid slowly flows into the artery by gravitation.

Whatever method is used, the solution must always be hot —about 100° F. Half an hour or more may be required to allow the gradual introduction of a sufficient quantity of the fluid.

The *simplest and best* method of replenishing the depleted bloodvessels and restoring the circulation (far safer than transfusion into an artery or vein), is to inject large quantities of the saline solution hypodermically into the cellular tissue, either in front of the chest, or behind between the scapulæ or into the nates. Two or three pints of "normal salt solution" (*i. e.*, three grains of common salt to the ounce of water—approximately 100 grains, or a small teaspoonful, to water one quart) is prepared (the water having been previously sterilized by boiling) and placed in a fountain syringe, the tube of which is surmounted with a large hypodermic or exploring needle, which is plunged beneath the skin and the solution allowed to flow into the cellular tissue by gravitation.

After reaction has been established, the woman will suffer, perhaps for several days, with neuralgic headache, and photophobia, due to cerebral anæmia; hence iron, quinine, and nutritious diet will be required, and opium to relieve the pain.

Secondary Post-partal Hemorrhage (*Puerperal, or Remote Hemorrhage*) may occur within three or four days, or even as many weeks, after labor. Its *causes* are: retained blood-clots, membranes, or pieces of placenta, or (perhaps unsuspected) a

[1] This is the method of Dr. R. H. M. Dawbarn.

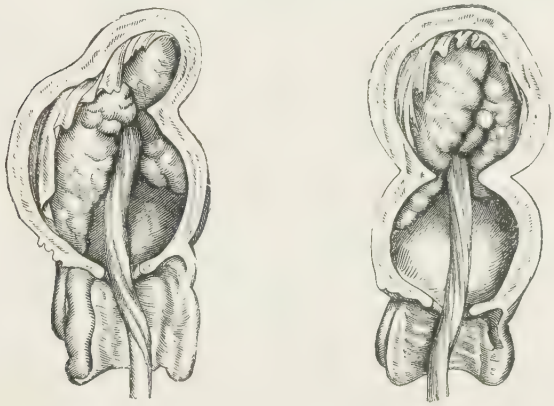
placenta succenturiata, in the uterus. It may also arise from violent mental emotion, or physical exertion, or use of alcoholic stimulants soon after labor. Fecal accumulation; retroflexion of the womb; laceration of the cervix; inversion; thrombus of cervix or vulva; fibroid and polypoid tumors; and certain blood-changes, such as those of profound anæmia, uræmia, or miasmatic poisoning, are additional causes. One case occurring eight days after labor, followed the inhalation of chloroform and aconite for insomnia. *Symptoms:* Bleeding may come on suddenly (quantity variable), stop, and recur at intervals. It may, or may not, be accompanied by fetid discharges, and septicæmic symptoms. *Treatment* depends upon cause, which must be thoroughly investigated. In case of retained clots or secundines, remove them by finger or blunt curette, swab uterine cavity with tincture of iodine, and *give ergot* with tinct. cannabis Indica gtt. xv. every six hours. If septicæmic symptoms, creolin injections to uterine cavity, with care to insure their immediate return. Retroflexion will require replacement and a full-sized Hodge pessary. The inverted womb must, if possible, be replaced, or astringent washes applied to the bleeding surface in case of failure. Whether or not the cause have been discovered, the bleeding may be often arrested by vaginal injections of hot water (110°–115° F.) continued for ten or fifteen minutes. Should it fail, pack the cavity of the uterus with iodoform gauze.

In any case absolute rest and mental quietude, with tonics —especially tinct. ferri chloridi—and nutritious liquid diet, as a matter of course. Other plans of treatment will be suggested by the remaining causes before mentioned.

Morbid Retention of the Placenta, from causes other than inertia uteri, has been referred to as an additional factor in the production of post-partal hemorrhage. It is commonly due to *morbid adhesion* of the placenta to the uterine wall, in consequence of placentitis, or inflammation of the uteroplacental junction, having taken place during pregnancy; or there may have been chronic inflammation of the lining of the womb (endometritis), with hyperplasia of connective tissue, before impregnation. Abnormal placental adhesion is often associated with, and is indeed a cause of, *irregular "hour-glass" contraction* of the uterus (see Fig. 200), which consists in a spasmodic contraction of some of the circular mus-

cular fibres of the womb near its middle, the placenta being retained above the constriction, through which last the umbilical cord may be traced up from the os externum.

FIG. 200.



Hour-glass contraction of uterus, with encystment of the placenta.

Spasmodic contraction of the os is another condition by which delivery of the placenta may be delayed.

Treatment.—Spasm of the os, and spasm of the circular fibres higher up, may both be overcome by *steady, continuous pressure* with the hand, the finger-ends being approximated into a cone, or one finger put in at a time until all have entered, when the hand may be gradually forced through the constriction, counter-pressure being always made by the other hand upon the fundus. The placenta is then, if *not* adherent, simply grasped by the hand and gently withdrawn during a contraction of the uterus, aid being afforded by pressure on the fundus and by ergot. If the organ *be* adherent, the morbid adhesion must be broken up, and the placenta completely separated before withdrawal is attempted. A finger —one or two—must be insinuated between the uterus and placenta at some point already partially separated, or, if no partial separation exist, at a point where the placental border is thick, and then passed to and fro, transversely through the utero-placental junction, acting like a sort of blunt " paper-

knife," until separation be complete. Another mode is to find, or make, a margin of separation as before, and then peel up the placenta with the finger-ends, rolling the separated portion toward the hand-palm upon the surface of the still adherent part, as one might lift up the edge of a buckwheat cake and roll it upon itself until it were turned completely over and separated from the plate on which it lay. Strong fibrous or fibro-cartilaginous—rarely, even partially ossified—bands may require to be pinched in two between the thumb-nail and index-finger. Great care is necessary to avoid peeling up an oblique layer of uterine muscular fibre, which might split deeper and deeper until leading the finger-ends through the uterine wall into the peritoneal cavity. Should such a splitting begin, leave it alone and recommence the separation at some other point on the placental margin. It is sometimes only possible to get the placenta away in pieces. These should be afterward put together and examined to indicate what remnants are left behind. It may be quite impracticable to get out every bit, but small remnants, or thin layers too firmly adherent for removal, do not distend the womb enough to create hemorrhage from their bulk, and the subsequent danger of septicæmia from their decomposition may be obviated by injecting warm (2 per cent.) creolin water into the uterus, twice daily, until everything have come away.

In cases where the placenta is retained from its *unusually large size*, hook down one edge of it with the fingers to insure its presenting endwise instead of flat like a button buttoned in a button-hole, and then make downward and *backward* traction—*aided by abdominal pressure*—to draw it through the os uteri. To make the *backward* traction referred to, dig one or two finger-ends into the substance of the placenta, if it cannot be grasped firmly enough by the finger-ends, and manipulate as if attempting to *push it toward the sacrum*. A part of the organ having thus been made to bulge out of the os, release the fingers and hook them into the placenta again, higher up, and so on until it have entirely passed into the vagina.

When, in extracting placenta artificially, the hand has been introduced into the womb, the latter should be washed out afterward with the 2 per cent. creolin solution.

Introducing the hand into the *vagina* for extraction of the placenta is sometimes sufficiently painful to cause objection

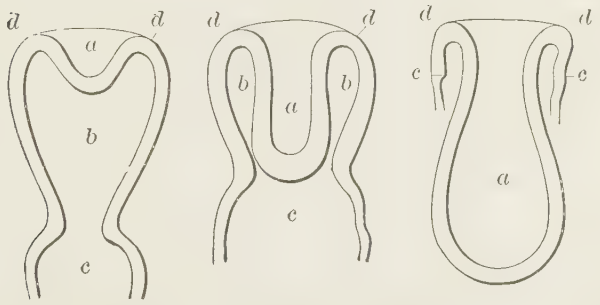
and resistance on the part of the female, the vulvar orifice being tender or perhaps more or less lacerated. A little firmness of purpose, sometimes lacking in the young practitioner, coupled with moral encouragement of the woman, and gentleness of manipulation, will remedy the difficulty.

CHAPTER XXVI.

INVERSION OF THE UTERUS.

The womb may be inverted in various degrees, from a simple indentation of the fundus to its being turned completely "wrong side outward," and hanging upside down in the vagina. It usually begins by "*depression*" of the fundus, the top of the uterus being indented like the bottom of an

Fig. 201.



Three degrees of inversion.

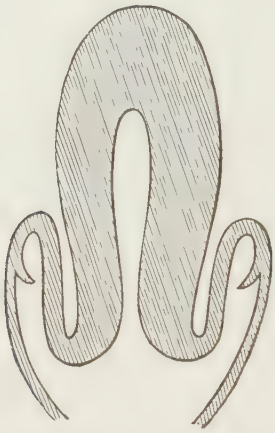
a. Depression of fundus. *b*. Uterine cavity. *c*. Vagina. *d* to *d*. Normal line of fundus before inversion.

old-fashioned black bottle; this may go on until the fundus reach and begin to protrude through the os into the vagina ("*partial inversion*"), or the protruding part may come through more and more, until the whole organ be turned inside out ("*complete inversion*"). (See Fig. 201.)

Occasionally inversion begins at the neck, the fundus being then inverted last. (See Fig. 202, page 422.)

Causes.—Under any circumstances inversion of the uterus is rare, but it is usually the result of mismanagement—traction on the cord, or upon an unseparated adherent placenta, during the third stage of labor, especially when the womb is not well contracted. Other causes are: an *actually* short umbilical cord, or one that is *practically* short from coiling round the child; sudden delivery, particularly while standing, and when the uterus is over-distended and relaxed;

FIG. 202.



Inversion beginning at the cervix. (After DUNCAN.)

violent straining or coughing efforts after delivery; forcible and injudicious pressure upon the fundus from above, whether by the hand or heavy compresses. In short, a *relaxed* womb may be inverted either by pressure from above or by traction from below: inversion of a well *contracted* uterus is impossible.

A very few cases have occurred after abortion and in unimpregnated uteri with polypi whose pedicles were attached near the fundus, but these last belong to gynecology.

Symptoms. — Hemorrhage, faintness, shock, pain, vesical and rectal tenesmus. Abdominal palpation reveals "depression" of fundus, and bimanual examination, in "partial" and "complete" inversion, demonstrates respectively partial

or complete absence of uterus from its normal position in the pelvis. Diagnosis may be obscured by a full bladder (produced by the inversion), but using a catheter will relieve this difficulty. Vaginal examination discovers uterine tumor occupying the vagina, together with the placenta, if this last have not been previously delivered.

A fibrous polypus (the only thing liable to be confounded with an inverted womb) may be diagnosticated from the uterus by its *complete insensibility*, its *total want of contraction when handled*, and by *following its pedicle through the os uteri up into the uninverted uterine cavity*, which last may, in any case of doubt, be demonstrated with the *uterine sound*. Feeling the womb in its proper position, through the abdominal wall, shows the organ is not inverted. Uterine inversion is hardly likely to be mistaken for polypus, except when the organ remains inverted for months (sometimes for years) after labor, becoming reduced in size by involution ; such cases are called "chronic inversion," and properly belong to gynecology.

The *prognosis* of uterine inversion during labor is always serious. The great immediate danger is profuse hemorrhage, the *more* profuse when associated with inertia uteri, and perhaps some spasm of the os. Much depends upon the early reduction of the inversion. Every minute adds to both danger and difficulty. Exceptionally, the placenta may be sufficiently adherent to prevent great hemorrhage.

Treatment.—"Depression" of the fundus and "partial" inversion may be readily reduced, by passing the hand into the womb and pushing out the indented portion, while the organ is then stimulated to contract.

When inversion is "complete," reduction may still be easy if attempted at once, but not so after delay. If the placenta be still wholly or in great part adherent, it should be attempted to push it back with the uterus, the closed fist being pressed against the dependent fundus, on which the placenta forms a cushion, while *counter-pressure is made with the other hand over the abdomen*. When the bulk of the placenta interferes with reduction, and when it is already in great part detached from the womb, its separation may be completed before pushing back the fundus. When constriction of the os, and other causes, have produced swelling and congestion of the inverted uterine body, the latter must be compressed between the two hands steadily for a few moments to lessen

its bulk before reduction is attempted; or this may be done more effectually by bandaging the inverted organ with a strip of iodoform gauze.

Should spasmodic constriction of the os render reduction impossible even by *steady, firm* pressure, anæsthesia may be resorted to to relax the spasm, but the main principle of success in these cases is to maintain *continued pressure,* without any intermission, for five, ten, or fifteen minutes, and with like continued *counter-pressure.*

After reduction, the hand must not be withdrawn from the uterine cavity until the organ have been made to contract, and the placenta, if pushed back with the womb, must then be separated and withdrawn, as in other cases.

To further prevent a return of the inversion, the uterine cavity should be irrigated with hot water—110°–115° F.—a quart or more may be required; it secures contraction and arrests bleeding.

When the dependent inverted fundus refuses to yield readily to manual pressure, one or both of the angles of the womb, where the Fallopian tubes enter, may be first indented in the operation of reduction. Inertia and hemorrhage resulting from, or complicating inversion, require the remedies for post-partal hemorrhage. (See Chapter XXV.)

The strictest antiseptic technique must, of course, be observed in all these manipulations, and, after the inverted womb is finally replaced, its cavity must be washed out with the creolin solution.

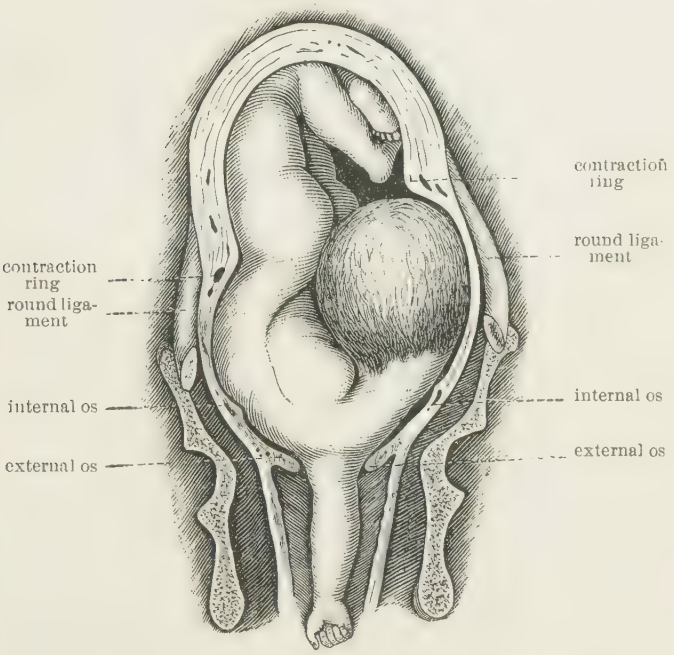
CHAPTER XXVII.

RUPTURE OF THE UTERUS, VAGINA, ETC.

Rupture of the Uterus may occur in any *direction,* transversely, longitudinally, or both; in any *position,* fundus, body, or neck, most frequently toward the last; and in various *degrees*—that is, through the muscular wall without rupture of the peritoneum—"*incomplete* rupture," or through both peritoneal and muscular coats—"*complete* rupture."

Causes.—Strong uterine contraction coupled with mechanical impediment to passage of child—conditions existing in transverse presentations, pelvic deformity, or contraction, and with large size of fœtus, especially of the fœtal head, as in hydrocephalus, obstruction from fibroid or other tumors, etc.; the danger in all of these cases is increased by *ergot*, which is

FIG. 203



Arm presentation with threatened rupture of thinned lower segment of uterus. (After SCHRÖDER.)

sometimes unfortunately given. Occasionally rupture occurs *without* obstruction to passage of child; it is then explained by *tissue degeneration*—fatty, fibrous, or tubercular—of the uterine wall; or the tear may occur at the site of a previous rupture, or through the old scar of a former Cæsarean section. It may also result from traumatic injury following blows,

falls, squeezing, etc. The uterine wall is, rarely, nipped and pinched between the presenting part of the child and abnormal sharp edges of bone projecting into the pelvic canal, by which a solution of continuity—the beginning of rupture—is produced. Multiparity, and the thinning of the uterine walls

FIG. 204.



Thinning of lower segment of uterus in obstruction from hydrocephalus. (After BANDL.)

due to frequent childbearing, are predisposing causes. Anteflexion, anteversion, cervical obstruction, and lateral obliquity of the uterus, constitute other instances of mechanical hinderance to labor liable to be attended with rupture. The womb may be ruptured by violent and unskilful manipulations during version and forceps operations. Inflammatory changes

in the uterine tissues, due to prolonged pressure between the fœtus and pelvic walls, conduce to rupture—even ulceration and gangrene may occur.

Symptoms.—Although rupture generally occurs suddenly and without warning, the existence of conditions mentioned under the head of "causes" ought to be sufficient to indicate danger of the accident. In the more usual cases of mechanical obstruction there occurs, some time before rupture, a remarkable thinning and stretching of the lower segment of the uterus, while the upper and middle segments of the womb are thickened, the line of division between the thin and thick portions constituting a perceptible ridge or furrow, commonly known as the "*Ring of Bandl*," by whom it was described. This condition is shown in Fig. 203 (page 425), illustrating the result of prolonged labor in an arm presentation. On one side fully half of the uterus, extending from the shoulder of the child to the top of its head, is thinned as described. The same condition appears in Fig. 204 (page 426), showing obstruction from a large hydrocephalic head; the thin, stretched part of the uterus extending from the os uteri, on a level with the pelvic brim, up to the child's arm.

It is this thin portion that is especially liable to rupture. The increased thickness of the upper segment is explained by muscular retraction, and by what has been termed "*migration*" of the muscular layers—they separate from each other; some slip up by contraction, and leave the wall below thinner, but thicken the part above. (See Figs. 203 and 204.) *Preceding* rupture, therefore, the ring of Bandl, running obliquely or transversely across the uterus, may be discovered by abdominal palpation, and as the pains—usually rapid and violent—progress, the ring gets higher up toward the fundus; the *round ligaments* may also be felt as *tense cords* through the abdominal wall. The *vaginal* wall may also be tense and stretched. Such conditions indicate *danger of impending rupture.* They are often coupled with symptoms of general exhaustion from prolonged effort, viz.: small, quick pulse; hurried breathing; anxious expression; pronounced mental despondency or despair, etc.

When rupture actually occurs the typical symptoms are: a sudden sharp pain in the womb (caused by its tearing), sometimes accompanied by an audible noise; sudden and simultaneous cessation of labor pains; a sensation as if warm

fluid (really blood) were being diffused into abdomen; violent shock and collapse, indicated by pallor, feeble and frequent pulse, cold extremities, fainting, hurried respiration, vomiting, etc. (usually due to hemorrhage into the peritoneal cavity). On *vaginal examination* the presenting part of the child is found to have receded from its former situation, owing to partial or complete escape of the fœtus through the rent into the abdominal cavity, where, by *abdominal palpation* it may be felt as an irregular-shaped, movable tumor, more or less distinct from another tumor formed by the partially contracted uterus. Blood may or may not escape from the vagina. A loop of intestine may prolapse through the rent and be found by vaginal examination.

The foregoing array of symptoms would leave no room for doubt in diagnosis. But when rupture takes place more gradually, or is "*incomplete*"—*i.e.*, when the muscular coat *only* is ruptured, the peritoneum remaining intact, the symptoms are less decided. The child will *not* have escaped—at least completely—into the abdomen, but will be contained in a stretched pouch of peritoneum, so tense that the different parts of the child cannot be recognized in it by abdominal palpation, whereas in "*complete*" rupture the fœtal parts are *easily* recognized and can be easily *moved* about, resting loosely, as they do, immediately beneath the abdominal wall. The presenting part may or may not have receded. In a gradually progressive rupture labor pains may continue and force the child gradually through the enlarging rent. In some cases the presenting part becomes *impacted* in the pelvis, so that it *cannot* recede.

Prognosis.—It must be understood that rupture (laceration) of the *vaginal portion* of the cervix uteri may, and frequently does, occur during labor without any necessary immediate danger to life; but in these the tearing does *not* involve the peritoneum, and escape of blood, etc., into the abdominal cavity.

Rupture involving any portion of the womb *above* the vaginal part of the cervix is a different affair. The prognosis is here most grave. Death may ensue rapidly, either from profound shock, or hemorrhage into the peritoneum, or, surviving these dangers, fatal peritonitis and septicæmia may shortly follow. The maternal mortality much depends upon the severity of the case, the extent of rupture, and the treat-

ment adopted. Formerly it was stated only one out of six cases survived, but by the timely performance of laparotomy the results have become so much more favorable that over half the women are saved. The fœtal mortality is still greater, survival of the child being a rare exception.

Treatment.—Before the occurrence of rupture, but when existing conditions indicate an evident liability to the accident, every means of *prevention* must be adopted. Though good may be done in certain cases by the rectification of malpresentations, uterine obliquities and flexions, still the main prophylactic resort is *delivery*, either by forceps, version, craniotomy, or whatever other method the circumstances of the case require or will admit. Whatever method is adopted, extra care is necessary to avoid violence of manipulation, particularly when version is attempted. The thin distended lower segment of the womb may be easily ruptured even by moderately violent manipulations, and in cases where the child is dead, craniotomy and embryotomy should be resorted to by preference, notwithstanding sufficient amplitude of the pelvis to admit of version being performed.

After rupture has occurred, especially if it be at all extensive, whatever is to be done had best be done quickly. There must be no delay. The results of modern practice and the weight of professional opinions have of late strongly tended to the conclusion that *laparotomy* (cutting through the abdominal wall and taking out the child, blood-clots, etc., through the incision) should be at once performed *in all cases of extensive uterine rupture.* Such a rule, however, has not yet been finally adopted.

When the abdomen is opened and the child, etc., removed, the rupture in the uterine wall is sutured as in Cæsarean section; but should the laceration be of such a character or in such a direction as not to admit of being securely sutured, or should the uterine tissues be much infiltrated, bruised, or inflamed, it may be best to amputate the womb by Porro's operation. (See Chapter XX.)

The child should certainly be delivered without delay in all cases. This rule is invariable. The *mode* of its removal is the difficult point to be decided in a special case. In this decision but little value must be accorded to the life of the child. It will generally die. Should craniotomy or cephalotripsy, therefore, appear to afford the speediest method of

delivery, they may be employed, even though the child still live, and though it were possible, with a little more delay, to extract it by version or forceps. Delivery, however, through the natural passages *must not be attempted* by any operation, when the child has entirely, or in a great measure, escaped through the rupture into the cavity of the abdomen. Then laparotomy is, without question, the preferable resort.

When, on the other hand, the child has not escaped ; when the os uteri is dilated and the head presents ; and when there is no mechanical obstacle to rapid delivery by forceps, this instrument may be applied. If necessary, and the proper instruments are obtainable without delay, perforation of the skull may precede forceps. In other cases, when the child still remains in the womb, but delivery by forceps is not likely to be rapidly successful, the main resort is version by the feet. Even when part of the child *has* escaped into the abdomen, provided it be not too great a part, version may still be performed. The utmost care is necessary to avoid enlarging the rupture and pulling down a loop of intestine, and when the child is delivered, extreme caution is required in delivering the placenta. The ruptured womb will not expel this last spontaneously. The hand must be passed into the uterus for its withdrawal, as in other cases. If the placenta have escaped through the rent (which is unusual when the *child* has not done so), traction may be made on the cord to bring it near, or into the tear, so that the hand in the uterus may get hold of it without the necessity of passing the hand through the rent into the abdominal cavity. When delivery is complete the cavity of the womb must be washed out with creolin solution (2 per cent.) and tamponed with iodoform gauze—the latter serves both for arresting hemorrhage and for drainage ; the gauze may remain two days.

Subsequent Treatment.—Stimulants to counteract shock and collapse from hemorrhage. Opiates to relieve pain. Daily cleansing of uterine cavity by the creolin solution. When the child has been delivered by the vagina, some recommend that the nozzle of a syringe be passed up into the uterine cavity and through the rent into the *peritoneal* cavity, which last is thoroughly washed out with pure hot water (100° to 104° F.), and a drain of iodoform gauze afterward placed in the uterus.

From the dreadful mortality following rupture of the

uterus the importance of *prevention* in the different cases when it is likely to occur cannot be too ardently accentuated. Thus, in impending rupture with cross presentation, decapitate; with hydrocephalus, perforate; in breech presentations deliver with blunt hook; in cases of pelvic narrowing the required operative methods must be done *without delay*. As a *general rule*, when the lower segment of the womb is *greatly thinned*, version is contra-indicated.

Rupture (Laceration) of the Vaginal Portion of the Cervix Uteri.—Slight superficial lacerations are very common, and often unrecognized. Even considerable ones pass unnoticed by the obstetrician more frequently than they would if properly sought for, as they should be after labor is over. Occasionally they extend up to the utero-vaginal junction, or into the vaginal wall. Sometimes transverse in direction (though generally longitudinal); pieces of the os may hang downward in the vagina, and rarely an entire ring of the vaginal cervix may be separated.

Causes.—Distention by the presenting part of the child during labor; rough manipulations during version, forceps, and other operations; incarceration of the anterior lip of the os between the head and pelvis. Tissue-changes preventing dilatation of the os, and primiparity, especially in elderly women, are predisposing causes.

Symptoms.—Hemorrhage, more or less profuse, according to the extent of laceration, the latter to be diagnosticated by digital examination, or, if necessary, by ocular inspection with speculum.

Treatment.—Slight lacerations get well rapidly without treatment. In more severe ones hemorrhage may be controlled by application of the solution of persulphate or perchloride of iron on cotton plugs, or by a tampon of iodoform gauze. Extensive cervical lacerations should be united at once by sutures of catgut, silk, or silkworm-gut; this prevents the subsequent occurrence of congestion, inflammation, and hypertrophy, etc., of the cervix, which may require restoration of the laceration by sutures, etc., months or years afterward. The suturing may be done with the aid of a Sims's speculum; or the womb may be pushed down by abdominal pressure from above until the cervix become visible at the vulva.

Carbolized injections into the vagina for a few days after

labor, when laceration exists, should always be employed to prevent absorption of septic matter by the raw surfaces.

LACERATIONS OF THE VAGINA ITSELF, OR OF THE VAGINAL ORIFICE, are recognized by digital examination or inspection. Rarely, superficial or moderately deep lacerations occur near the urethral meatus or, involving the urethra, vestibule, urethra and its meatus sometimes with considerable bleeding. They require antiseptic cleanliness—lasting with iodoform—and, if deep enough to cause hemorrhage, sutures of fine silk, which may be removed in four or five days.

RUPTURE OF THE DEEP TISSUES OF THE VULVA—of their loose tissue and bloodvessels—without any necessary laceration of skin or mucous membrane—may occur either during or after labor. Blood is immediately extravasated, causing the labium to swell rapidly, and constituting a hematoma or thrombus, to be now described.

THROMBUS OF THE VULVA.—A tumor—bluish in color, elastic or fluctuating, accompanied by sharp pain, usually on one side—forms rapidly, sometimes of such great size as to prevent delivery mechanically. It may burst and lead to profuse or even fatal external hemorrhage. Extravasation may extend upward inside the vaginal wall to the uterus, or even to the cellular tissue of the iliac fossa, or behind the peritoneum to the kidneys.

The *prognosis* is variable, according to the extent of the injury and extravasation. Death may result from hemorrhage, or from decomposition of retained clots and septicemia. In many cases, of moderate extent, absorption of the effused blood and recovery take place.

Treatment.—During labor, delivery should be hastened—preferably by forceps, and this made before the thrombus has had time to grow very large. If its size prevent delivery the tumor must be incised, the clots turned out, subsequent hemorrhage controlled by compression, or pledgets of cotton containing solution of perchloride of iron, and delivery by forceps rapidly completed. After labor, when the thrombus has been opened artificially or otherwise, styptics and compression may still be required to prevent further bleeding. If delivery have been completed without opening the tumor, in

must be left alone for absorption to take place. Should suppuration occur, as sometimes happens in a few days, the part must be incised to give exit to pus and clots, and antiseptic treatment of the wound adopted to prevent septic infection. In all cases absolute rest in the recumbent posture and the avoidance of straining efforts of every kind are indispensable, to prevent recurrence of hemorrhage. The bleeding (or extravasation) may also be controlled by vaginal hydrostatic pressure, an elastic rubber bag, or Barnes's dilator, filled with ice-water, being introduced into the vaginal canal, for a few hours subsequent to delivery. Carbolized washes to be used after its removal.

Rupture of the Perineum.—Causes and mode of prevention of this accident during labor have already been considered. (See Chapter XII.)

Every woman ought to be carefully examined after delivery, by inspection of the parts, to ascertain if perineal laceration exist.

Slight fissures of the posterior commissure, or of the fourchette in primiparæ, usually heal of themselves without treatment. Extra antiseptic cleanliness is, however, advisable. Even tears of apparently considerable size shrink almost to nothing when the tissues have recovered from the distention of parturition, as they do in a short time. The extent of rupture may be either seen or made out by passing a finger into the rectum and thumb into the vagina, so as to hold the remaining recto-vaginal septum between the two. Extensive lacerations often involve the sphincter ani, posterior vaginal wall, and rectum. For convenience of description, lacerations of the perineum have been divided, according to their extent, as follows: those extending from the posterior commissure *half way* to the anus, are called lacerations of the *first degree;* those extending *to* the anus but *not* involving its sphincter, the *second degree;* and those extending through the sphincter ani into the rectum are lacerations of the *third degree* or "*complete*" ruptures. Rarely, a "*central*" perforation without any tearing of the posterior commissure of the vulva takes place, between the two openings of the vagina and rectum, through which the child may pass.

While the *diagnosis* of laceration and its degree is made by inspection and digital manipulation, the *symptoms* of *pain*

and *soreness* at the seat of injury, and more or less bleeding from the wound, will, of course, be present.

Treatment.—Unless the laceration be quite insignificant, the treatment consists in bringing the freshly lacerated surfaces together by silk or catgut sutures *immediately after labor.* This is to be done, whether the sphincter ani be torn or not. In fact, the more extensive the laceration the more the necessity and greater advisability of stitching up the rent. In bad cases, requiring *extra* surgical skill—not immediately available—a delay within twenty-four hours may be justifiable to obtain it, and would not make very material difference, apart from disturbing the woman when she ought to be at rest.

In lacerations of the first and second degrees (*not* involving the sphincter ani and rectum) the operation is not difficult. The woman is laid across the bed, her hips brought to the edge of it, her lower limbs held by assistants and flexed in the lithotomy position. Anæsthesia by ether, or local anæsthesia by injecting a 4 per cent. sterilized solution of cocaine, may be used, if necessary, to keep the patient still. The parts are cleansed and a pledget of sterile cotton or gauze pushed up the vagina to stop any flow from the uterus obscuring the wound. The sutures (preferably of aseptic silk) are passed with a moderately curved needle about two inches long, as follows: beginning at the posterior end of the laceration (that nearer the anus), the needle enters the skin near the edge of the wound and follows a circular course until its point appears at the very bottom of the laceration (a finger of the other hand in the rectum guarding against its penetrating that canal); it then enters the opposite side of the laceration at the bottom of the wound and comes out of the skin opposite its point of entrance, having followed a similar circular course to that pursued on the other side where it first went in. The ends are *loosely* tied or secured by catch-forceps, until the requisite number of sutures are passed in a similar manner (half an inch apart), when the wound is again cleansed, the vaginal plug removed, and the sutures tied tightly enough to coapt the parts without injurious constriction, the order of succession in tying being that in which the sutures were passed.

In "complete" lacerations—those of the *third* degree—through the sphincter ani to the rectum, the operation is more difficult. The rectal tear is first stitched with *catgut* sutures (a short, curved needle being used) and going through the

rectal wall only. The sutures are tied on the inside, so that the knots are on the mucous membrane of the bowel. They begin from above and come down to the sphincter ani, the cut ends of which are drawn out with a tenaculum while the sutures penetrate them. These *catgut* sutures need not be removed: they will digest in the tissues and disappear of themselves. The posterior wall of the vagina is next sutured with fine silk, from above downward toward the hymen. Finally, skin sutures through the perineum itself, including muscles of the pelvic floor (as just described for lacerations of the first and second degrees) complete the operation. The silk sutures may be removed in about a week. Antiseptic dressings are applied as after an ordinary labor, extra care being taken to keep the wound aseptically clean by daily irrigation with the creolin solution.

Loosening of the Pelvic Articulations—of the pubic symphysis and sacro-iliac synchondrosis—occasionally occurs, either from pathological changes in the joints, or from great violence during forceps and other mdoes of artificial delivery, or both conditions exist together. The *symptoms are*, at the time, pain and increased mobility of the articulations, demonstrated by grasping the two iliac bones near the anterior extremities of their crest, one in each hand, and moving them slightly to and fro, transversely, in opposite directions. After getting up, pain may be absent, but the patient is unable to walk, except with difficulty. If two fingers be passed into the vagina and placed behind the pubic symphysis, and the thumb in front of it, while the patient, standing, rests her weight first on one leg and then on the other, or sways her body from side to side, movement of the pubic bones against each other may be recognized.

Treatment.—Rest in bed upon the back, and support of the pelvic walls by a circular bandage of strong canvas or strip of rubber adhesive plaster about three inches wide, passing round the body between the anterior superior spinous processes of the ilia and trochanters; it must go just *below* the spinous processes so as *not* to press upon them. It should be worn for weeks or months after getting up. It may be made continuous with or attached to a pair of short breeches or tights fitted on the upper part of the thighs, to prevent slipding up. Recovery usually results.

CHAPTER XXVIII.

MULTIPLE PREGNANCY—HYDROCEPHALUS AND OTHER ENLARGEMENTS OF THE CHILD.

The simultaneous existence of two or more fœtuses in the womb is termed "multiple" or "plural" pregnancy. The number of ova may be two, three, four, or five, named, respectively, twins, triplets, quadruplets, and quintuplets. Reported cases of more than five are not well authenticated. Twins occur once in about seventy-five cases; triplets once in about five thousand; quadruplets and quintuplets are extremely rare.

Plural pregnancies are produced by two or more ovules entering the uterus and becoming impregnated about the same time. One ovule may come from each ovary, or two from the same ovary. In the latter case both ovules may come from one Graafian follicle, or each from a separate one. Again, one ovule may contain two germs, like a double-yolked egg from the fowl. These several modes of origin explain the observed variation in the arrangements of the placentæ and fœtal membranes in different cases. Generally each ovum (in twin cases) has its own sac of amnion and chorion, which comes in contact with that of the other as growth advances; but the two sacs do not amalgamate; they remain separate till birth. In these there are two placentæ, usually separate from each other, though they may be near together, or partially united. In other cases each ovum has its own amnion, but both are contained in one chorion. In these the two placentæ are fused together, or the two umbilical cords may be united before reaching the placenta. Rarely both fœtuses are contained in one amnion, as well as in one chorion. Here, again, the placentæ are united in one mass. Two ova contained in one chorion are of the same sex.

The fact that the vessels of the two placentæ and of the two cords may inosculate with each other (but which cannot be made out before delivery), leads to an important modification of the management of labor in twin cases, to be mentioned presently.

The growth of the embryos in twin cases is seldom exactly equal, and sometimes the difference is very great, one child appearing fully developed while the other remains very small. One fœtus may die and be thrown off prematurely, while the other remains till full term; or the little dead one may still remain *in utero*, and come away at full term with the live one. These variations are due to conditions favoring the nutrition and circulation of one fœtus at the expense of the other, such as folds or compression of the cord and compression of the placenta. When the two fœtal circulations inosculate in the cord or placenta, one fœtus having a stronger heart than the other, favors its better nutrition and development. In this way *acardiac* monsters are produced.

Occasionally one child remains for days or even weeks after the birth of the first one before it is delivered, and thus completes its development. Such cases are best explained by the existence of a double uterus.

Plural births generally occur a little before full term, the degree of prematurity increasing with the number of fœtuses. In twins only a few weeks may be wanting of the usual period: quintuplets are always abortions; the others are intermediate.

Diagnosis.—The certain diagnosis of twins before one child is born is sometimes difficult, but the following data will often be sufficient to render a diagnosis probable, and in some cases, when they are all available, a positive diagnosis may be reached. On *inspection*, the abdomen appears large in size and irregular in shape; the lower region of the abdominal wall just above the pubes is often swollen from localized œdema.

On *palpation*, the skilled hand discovers *persistent tension* of the uterine wall—*i. e.*, in an ordinary (single) pregnancy the womb becomes of a *wooden hardness* during contractions of the organ, but *soft and pliable* between the contractions, while in a womb over-distended with twins the organ becomes hard during contraction, but does *not* get soft and pliable during relaxation: an *intermediate degree of permanent tension remains* between the contractions, which is neither wooden hardness nor pliable softness.

In twins there are four fœtal poles—viz., two heads and two breeches. Palpation reveals one pole at or below the brim, another in an iliac fossa, and one (or two) somewhere

toward the fundus; or they may be situated differently. The resisting planes of *two backs* may be made out; and the movable small parts (limbs) may be felt at such divers and widely distant parts of the uterus as to make it inconceivable that they all belong to *one* child. Further signs: Exaggeration of those conditions of pregnancy due to pressure of the gravid uterus; the impossibility of *ballottement;* the recognition of two fœtal heart-sounds, not synchronous with each other, heard loudest at two different points of the abdominal surface, and becoming feeble or inaudible between these points.

After one child is born the existence of a second is readily made out by the still large size of the womb; by feeling the child through its wall over the abdomen; and by a vaginal examination, recognizing the bag of waters and presenting part of the second infant.

Women who have borne twins once are likely to do so again. The tendency to plural births is also hereditary in some cases, and may be conveyed by the *father;* hence a previous history of plural births in the family may be of *some* value as a means of diagnosis.

Prognosis.—Delivery of the first child usually tedious from inadequate labor pains, due to overdistention of the uterus, and from force of uterine contraction being necessarily diffused through bodies of both children, instead of being concentrated upon the presenting one. Delay is greater when first child presents by the breech, especially so in delivery of the after-coming head. Prolongation of labor, large area of placental surface, and overdistention of the womb, predispose to inertia uteri and post-partal hemorrhage. Malpresentations are more frequent than in single births. In about half the cases both children present by the head; in one-third of the cases one by head and one by breech; in one-ninth, both by the breech; and in one-tenth, either one or (rarely) both children present transversely.

Excluding the complications of malpresentation, the occurrence of twins, with proper management, need not preclude a favorable prognosis in the great majority of cases.

Treatment.—Tie the placental end of the cord when one child is born, to prevent possible hemorrhage from the second child, owing to inosculation of vessels between the two cords or placentæ. Let the placenta alone until after delivery of

second child, unless it be spontaneously expelled before then, when it may be carefully removed.

The alleged danger of mental shock from telling the woman she is to have a second child, is seldom serious, especially when she is told its delivery will be short and easy.

After one child is born there usually succeeds an interval of rest from labor pains for fifteen minutes, sometimes for half an hour or an hour, when contractions again come on, and the second child is easily expelled, the parts having been thoroughly dilated, and the second child being usually smaller than the first. During the interval, when rest is advisable for recuperation of the (perhaps exhausted) uterus, examination must be made to ascertain the presentation, and correct it if transverse.

After an hour, or before then if the uterus be *not* exhausted by previous prolonged effort, the membranes, if intact, may be ruptured, and the womb manipulated through the abdomen, to produce contractions.

In case of hemorrhage, convulsions, feebleness of the fœtal heart, or any condition rendering immediate delivery necessary, forceps may be applied if the head have descended into the pelvis, and version if it have not. In either case, extract the child slowly, so as not to leave an empty relaxed womb, every means being taken to secure simultaneous uterine contraction.

When both children are delivered, extra care is necessary to overcome inertia and prevent post-partal hemorrhage.

Treatment of Locked Twins.—When both children are contained in one amniotic sac, or when, there being two sacs, both have ruptured early in labor, both children may present and enter the pelvis together, and thus getting "locked" prevent delivery.

When both heads present *at the brim*, one may be pushed out of the way by combined internal and external manipulation, and forceps then applied to the other to bring it down into the strait and cavity of the pelvis.

When both heads have *passed the brim*, push back the second one, and apply forceps to the first (the lower) one. Should this be impracticable from the heads having descended too far, the lower head, and then the other, may be successively delivered by forceps. Exceptionally, craniotomy is required. The same mode of treatment may be necessary

when one head, having entered the pelvic cavity, is arrested by the jamming of the thorax against the second head, either at or above the pelvic brim. (See Fig. 205.)

FIG. 205.



Locked twins, both heads presenting.

When pushing back the locked presenting parts appears impossible, it may still be made easy, in some cases, by placing the woman in a knee-chest position, which should always be tried before any serious operation; the parts go back by gravitation. When the first child presents by the breech and is delivered as far as the head, the latter may remain above the brim, owing to the head of the second child having descended into the pelvic cavity, the head of each child resting against the neck of the other, so as to lock or lap the chins together, and prevent further progress. (See Fig. 206, page 441.)

Diagnosis of the exact arrangement of the complication having been made by the hand in the vagina, several different methods of delivery are avilable, selection of either being a matter of judgment determined by the peculiarities of each

case. As a rule, the life of the child whose breech is delivered will be enfeebled or lost by compression of its funis, or it may be already extinct. Hence in selection of operative measures superior value should be allotted the second child. The head of the second child may possibly be pushed up out of the way for the other to pass. The second head *may(?)* be delivered by forceps, while the first remains, but not without difficulty and great danger to both children. The head of the first child may be punctured, or even decapitated, so

FIG. 206.



Locked twins—one breech, one head.

as to allow extraction by forceps of the second one, the body of the first (when decapitation has been performed) being, of course, previously removed; its head coming after the other child is born. This last method probably affords the best chance for the second child. Most frequently both are lost. When the lives of both are extinct before delivery there still remains another resort, viz.: that of puncturing the second head and delivering it by forceps or cephalotribe past the body of the lower child.

The operation of symphyseotomy would seem to be a feasible method of relief in locked twins, but cases have not yet been reported.

In cases of *conjoined twins—double monsters*—when the natural powers are insufficient for delivery, version by the feet, and possibly subsequent mutilation, afford the best means of relief. Most such cases are, however, delivered spontaneously.

Hydrocephalus—distention of the skull from accumulation of effused serum—constitutes a dangerous impediment to delivery, leading to rupture of the uterus, or dangerous inflammation and sloughing of the mother's soft parts from their prolonged compression during a tedious labor. When slight in degree, labor may, however, terminate spontaneously without danger. In extreme cases the child's head is as large as that of an adult. (See Fig. 207, p. 443, also Fig. 204, p. 426.)

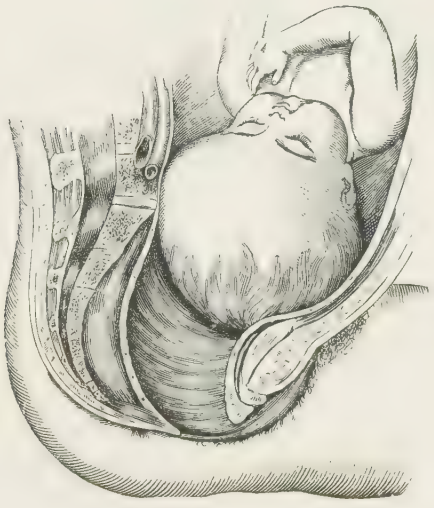
Diagnosis.—Difficult early in labor. Strong pains conjoined with a (known) normal pelvis, but without expected descent of the head, should excite suspicion and induce a careful examination. Owing to unusually large size of fœtal head, the child's body is higher up, hence sounds of fœtal heart heard level with or even above the umbilicus. When head arrested above superior strait, pass the whole hand into vagina (under ether, if necessary from pain) and feel the head. Its large size, wide, and perhaps fluctuating fontanelles and sutures are sufficiently characteristic. The head is less convex and feels more like a flat lid over the pelvic brim than a globular mass. The sutures and fontanelles become tense during a pain. The cranial bones are less resistant to the finger. An enlarged *posterior* fontanelle is very significant. The prominent forehead and superciliary ridges contrast with the comparatively small face of the child. The previous birth of a hydrocephalic infant, and comparatively feeble fœtal movements, are corroborative circumstances.

In breech presentations (they occur one out of five in hydrocephalic cases) the diagnosis is more doubtful. Nothing wrong is suspected, usually, until the body is born; then there is delay, an unusual resistance—a sort of elastic, resilient resistance—on making traction upon the body. The body *may* be well nourished, but frequently is small and emaciated. The uterine tumor is of larger size than usual above the pubes, owing to its containing the distended cranium.

Prognosis.—The chief dangers to the mother are uterine rupture; exhaustion; laceration, contusion, etc., of soft parts,

with subsequent ulcerations and fistulæ; all preventable, in great measure, by timely assistance of the obstetrician. The child generally dies, either before, during, or shortly after delivery. Exceptions possible.

FIG. 207.



Labor impeded by hydrocephalus.

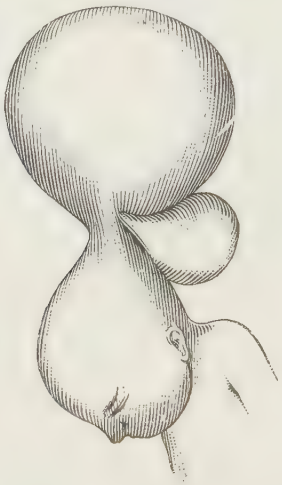
Treatment.—In head presentations, aspirate, or tap skull with trocar and canula to lessen its size, when this is absolutely required. Cases of moderate enlargement may be delivered spontaneously, but it is better not to risk life of mother by delay for the sake of a child whose survival at best is extremely dubious. After puncture, and reduction of size of head, it may be possible to extract by forceps, but they are nearly sure to slip off during traction if the head be very large. Then either the cephalotribe or cranioclast may be used; or the child may be turned and delivered by the feet, especial care and gentleness being necessary to avoid rupture of the womb.

In breech presentations, puncture of the aftercoming head may be made behind the ear, or through the occiput, or

through the orbit, or roof of the mouth; or the spinal canal may be opened and a wire or a metal catheter passed through it to the brain, and the fluid thus drawn off.

Encephalocele.—Associated with, though at other times independent of, congenital hydrocephalus, may be an accumulation of cephalic fluid outside the cranium underneath the scalp, forming a tumor, insignificant in size, or as large as a fœtal head, whose cavity may, or may not, communicate

Fig. 208.



Encephalocele. (From Hergott.)

with that of the cranium. It is attached to the head by a pedicle, and constitutes a so-called encephalocele. (See Fig. 208.) Fortunately, such tumors are most often attached either to the frontal or occipital pole of the fœtal head, and hence are less liable to interfere mechanically with delivery than when placed elsewhere. The bones of the cranium are also usually softer and more yielding. Puncture of the sac and evacuation of its fluid will remedy any mechanical interference with delivery that may arise.

Anencephalus.—A not uncommon monstrosity in which the brain is deficient or rudimentary; the upper part of the cranium is absent, leaving the base of the skull without bony covering; sometimes arrest of development in spinal column and spinal cord. Often associated with polyhydrammios. Shoulders may be very broad and obstruct delivery. Diagnosis sometimes made by finger touching the *sella turcica*, covered by soft tissues in base of skull, which may present at centre of pelvis. Child either born dead or dies soon after birth. In case operative assistance be necessary, perform embryotomy.

Ascites, Tympanites, Distention of the Urinary Bladder, Hydrothorax, Hydronephrosis, and various other pathological enlargements on the part of the child, may occasionally lead to difficult labor and require operative inter-

Fig. 209.



Distention of urinary bladder of the fœtus.

ference. (See Fig. 209.) They are extremely difficult to diagnosticate before delivery. The diagnosis chiefly rests upon the exclusion of more common causes of mechanical obstruction, and (in the case of gaseous or liquid distention of cavities, etc.) on the *springy, resilient resistance* recognizable when traction is made on the presenting or extruded fœtal parts. Liquid or gaseous accumulations are to be relieved by careful puncture, preferably by aspiration, if the child be living. Forceps, version, and exceptionally embryotomy, may afterward be required.

Large Size of the Child. Premature Ossification of the Cranial Bones.—In over-long pregnancies (those of 10½, 11, or 12 lunar months) the child is apt to be far above the usual size and weight. Instead of weighing seven or eight pounds (the average), it may reach twelve, fifteen, or even more, and though the increase is distributed over the whole body, the degree of cranial enlargement especially may considerably impede delivery, and a certain amount of difficulty may even attend extraction of the shoulders and body. In carefully measuring the cranium of a child weighing thirteen and a half pounds, immediately after birth, I found all of its diameters nearly an inch above the average length. Such infants are usually males. In well-formed and good-sized pelves, delivery may be accomplished by forceps, version, or symphyseotomy. In very extreme cases craniotomy may become a possible necessity. In delivery of the body, traction and manual aid in furthering the normal mechanism of labor will usually suffice.

Premature Ossification of the Cranium sufficient to interfere with moulding of the head, thus producing dystocia (difficult labor), is very rare.

Diagnosis by complete closure of the fontanelles and unyielding resistance of the bones to pressure of examining finger.

Treatment.—Forceps, if required; possibly perforation of the skull. In some cases symphyseotomy may be advisable.

CHAPTER XXIX.

TEDIOUS LABOR—POWERLESS LABOR—PRECIPITATE LABOR.

Tedious Labor (called also "Lingering," "Tardy," "Protracted," and "Prolonged").—These terms refer to *time*, but the duration of labor varies so widely within the limits of normality, that it alone is not sufficient to indicate the technical and practical meaning of "tedious" deliveries. Certain other phenomena, mentioned below under the head of "*Symptoms*," are necessary, before any case can be set down

in this category. Recent authors have almost abandoned the term "*tedious labor*," and include such cases under the caption of "*Dystocia*," meaning *difficult* or obstructed labor.

Causes.—The very numerous conditions liable to produce tedious labor may be broadly comprised in two lists: 1st. Conditions impairing the natural *forces* of labor; and, 2d. *Mechanical impediments* to delivery. Both kinds of conditions may, and necessarily often do, coexist.

The mechanical impediments refer either to the *mother* or to the *child*. Following the classification of Simpson, we have, therefore, altogether: (1) abnormal *power;* (2) abnormal *passage;* (3) abnormal *passenger*.

Abnormalities of Power.—The *main* force by which the child is expelled is that of *uterine contraction*. This may be impaired in various ways. In some cases the pains are *weak and inefficient from the beginning*—a condition of things quite different from weak pains *following* long-repeated *strong ones* and produced by uterine exhaustion. Or, again, the pains may have been moderately strong or normal at first, and then lapse into weakness later, but again *without* uterine exhaustion from prolonged effort. The *causes* of this *primary* inefficiency of uterine contractions are: overdistention of the womb from plural pregnancy or polyhydramnios; distention of the bladder or rectum; obliquities and displacements of the uterus; thinning of the uterine walls resulting from frequent and quickly repeated labors, or from degeneration of the uterine tissues; precocious or advanced age; general debility or feebleness of the woman from previous diseases, enervating habits, heat of climate, or of season, or the air of a superheated room; exhaustion of the woman from hemorrhage or from lack of sleep or food. Uterine action is sometimes inefficient from uræmia, and when there is morbid adhesion between the fœtal membranes and uterine wall. Mental emotions: fear, grief, surprise, anxiety, disappointment, and the presence of offensive persons or things will produce it. These last may depend upon idiosyncrasy or unaccountable personal antipathies. It should be especially noted that the lingering cases now described are characterized by *inefficient pains from the beginning of labor;* hence sometimes called *primary inertia*.

Another and different class of cases are those in which labor pains have been normally strong, or even stronger than

normal, and *afterward* become feeble and less frequent, or cease altogether. In these the womb becomes more or less passive from muscular exhaustion on account of overwork; it is *secondary inertia*. The organ simply needs rest. There may or may not be mechanical obstruction to delivery. This passive womb is *soft and pliable:* the different parts of the child may be *easily felt* by abdominal palpation.

A *third* set of cases are those in which the normal intermittent labor pains have grown feeble or ceased altogether, while the womb, instead of being soft and relaxed, is in a condition of *continuous rigidity:* its muscular walls *remain hard* and closely embrace the child with a *persistent* spasmodic grasp. This condition is spoken of as "*tonic contraction*" and "*uterine tetanus.*" The womb feels like a *solid tumor;* the different parts of the child *cannot* be recognized by palpation through its rigid walls. It is usually *caused* by some *mechanical obstruction* and consequent *uterine exhaustion* after prolonged and *unsuccessful strong expulsive pains.* Ergot may produce it. In some (but not in all) of these cases the thinning of the lower uterine segment and thickening of the upper region, separated by the "*retraction ring of Bandl*" (as previously described in the chapter on "Rupture of the Uterus"), may be discovered by palpation.

The so-called cases of "*tetanoid falciform constriction of the uterus,*" supposed to be an irregular, partial, or spasmodic contraction of certain more or less central circular bands of muscular fibres, and resembling the "*hour-glass contraction*" observed during the third stage of labor, is probably nothing more than tetanic constriction of Bandl's ring. It is so exceedingly rare that its occurrence has been denied by some, while others affirm they have clinically demonstrated its existence by feeling the constriction band like a "*metallic ring*" or "*circle of iron,*" with the hand in the uterus.

Still another abnormality of *power* consists in the pains being *excessively painful pains.* Usually due to exalted *nervous sensibility* or unusual *susceptibility* to suffering. Some *men* bear pain better than others; so with women in labor—some tolerate the suffering without much complaint, others are excessively sensitive.

In some the extreme pain has been ascribed to rheumatism of the uterine wall, or to parenchymatous metritis following a blow or some other traumatic injury before labor.

Again, either with or without any abnormality of the *uterine* contractions, labor may be impeded by some abnormality in the *contractions of the abdominal walls and diaphragm*—in the straining or "bearing-down" efforts, constituting the *secondary forces* of parturition. This may occur in any case where the woman is unable to take in a long breath and hold it long enough to accomplish the act of straining, as in diseases of the lungs, pleura, heart, or abdomen, or any other condition producing dyspnœa. Bronchocele, obesity, ascites, deformities of chest and spine, sometimes act in this way. Feeble abdominal contractions also arise from the *woman herself* being enfeebled by previous disease, or exhausted from previous prolonged straining efforts; or, again, excessive suffering may cause the woman to voluntarily refrain from bearing down.

Abnormalities of the Passage.—The mechanical impediments to delivery referable to faults in the parturient canal from which tedious labor may result are numerous, embracing, of course, every kind and degree of obstruction, such as smallness, deformity, and abnormal growths of the pelvis; and resistance, rigidity, deformity, and abnormal growths of the soft parts, etc.

Abnormalities of the Passenger.—The mechanical impediments on the part of the child are its over-large size, malpresentation, disturbed mechanism, pathological growths, locked twins, etc.

Prognosis and Dangers of Tedious Labor.—The first stage of labor, before rupture of the membranes, may be greatly prolonged, even for several days, without any *necessarily* serious consequences to either mother or child. Exceptions, however, occur. The continuance of anxiety, suffering, and physical effort, with consequent loss of sleep and inability to digest and assimilate food, if long protracted, *always* entail a *liability* to nervous exhaustion that cannot be regarded without apprehension in any case. Before rupture the waters act as a cushion between womb and child, thus protecting both from injurious pressure. Pressure upon the funis, and obstruction to the placental circulation, such as may occur when the womb is long contracted round and in close contact with the child, are also obviated.

During the second stage, when the womb *does* contract

powerfully and in close contact with the infant; when the placental circulation, therefore, *is*, or may be, partially interfered with; and when the soft parts of the mother, both the uterus and other parts below, are necessarily subjected to great pressure, the results of prolongation of the labor become far more serious. Swelling, œdema, inflammation, with subsequent sloughing and fistulæ, may occur; the child may die from continued compression of its skull, cord, or placenta; and general symptoms of exhaustion and collapse take place, from which the woman, if not promptly delivered, may die on the spot, or succumb afterward from post-partal hemorrhage, puerperal inflammation, septicæmia, etc.

Every case, therefore, of actual or impending tedious labor should excite apprehension for the woman's safety, increasing in degree according to the extent to which the symptoms have progressed, and the estimated difficulty of prompt delivery. With timely assistance safety may often be assured, while delay may render recovery impossible.

Symptoms.—These, be it noted once for all, usually begin moderately, but increase in varying degrees of rapidity with delay.

In cases of *primary uterine inertia* the pains (as we have said before) are usually inefficient *from the beginning*. These cases, unless *very* much prolonged, are *not* accompanied with *serious general* symptoms. *As a rule*, there is no great frequency and feebleness of pulse, no rapid respiration, no heat of skin, no fever, no general exhaustion; in fact, there has been no violent physical effort—no strong pains—to *produce* fatigue and expenditure of nervous force. Loss of sleep, lack of food, and anxiety, etc., may, however, *eventually* produce it in *very* protracted cases.

In cases of *secondary uterine inertia* the pains have commonly begun normally, and normally increased in strength, frequency, and duration, or they may have exceeded the normal limit in these respects. Both womb and woman have usually labored hard and (more or less) long, but the pains, though strong, have still been *relatively* inefficient—*i. e.*, they have been insufficient to overcome the existing resistance and accomplish delivery. There now appear symptoms indicating *exhaustion of the womb*, viz.: the pains become *irregular* in their recurrence, *shorter* in duration, *more feeble*, and *less fre-*

quent. Eventually they may stop altogether. The uterus is worn out by prolonged effort. Its relaxation becomes so complete that the different parts of the child may be felt by abdominal palpation through the now inert uterine wall.

A *second* set of symptoms are those indicating *exhaustion of the woman*, viz.: increased feebleness and frequency of pulse; coated tongue, becoming later dry and discolored: rapid breathing; vomiting; dejected countenance; restlessnes, despondency, irritable temper, peevishness, wilfulness, drifting on later (if not relieved) into delirium and despair.

A *third* set of symptoms—usually most pronounced when labor has advanced to the second stage—are those due to *commencing inflammation in the soft parts* from prolonged pressure against them of the child, viz.: *swelling, tenderness, pain, heat, lack of moisture*, in the vagina, uterus, vulva, etc., and demonstrated by digital examination, together with *redness, lividity*, or other abnormal discoloration demonstrated by inspection.

It should be especially noted that these three sets of symptoms may exist in *every shade of degree;* they may be only slight, or very pronounced. No case should be allowed to progress from the slighter and earlier symptoms of exhaustion to the later and more grave ones without prompt measures of assistance and relief.

In the *worst* cases, instead of the womb remaining soft and inert, and while intermittent pains may have *entirely ceased*, the uterus is *hard* and spasmodically *contracted round the child*, and *remains so continuously* (so-called "uterine tetanus"). Here the symptoms indicating *exhaustion of the woman* are much more pronounced than where the uterus is in a state of relaxation and inertia. Furthermore, in the rigid contraction condition the womb is *tender to the touch;* in the inertia cases it is *not* usually so. Some mechanical obstruction—either fœtal or maternal—commonly present, as indicated by lack of progress in descent, immobility and swelling of the presenting part, or by actual demonstration of existing impediment.

Diagnosis.—The combination of symptoms just stated, even in their early and slighter manifestations, especially when coupled with prolonged duration and lack of progress in the labor, and evident causes of mechanical hinderance to delivery, can leave no possible room for doubt. Other condi-

tions leading to cessation of labor pains, frequent and feeble pulse, collapse, such as, *e. g.*, rupture of the womb and hemorrhage, have a different history, and the symptoms are sudden, instead of gradual, in their approach.

Treatment.—The main element of treatment is to treat the case *early*, before the symptoms have progressed beyond recovery. The indications are, in the beginning, to correct or remove existing causes of uterine inertia and existing mechanical impediments to delivery. When manual or instrumental delivery is required, the operation should be begun, if practicable, before, or at least as soon as, the symptoms of tedious labor *begin*.

When the pains have been inefficient and feeble from the beginning (*primary* uterine inertia), the causes that lead to it must be removed.

In every case ascertain that the bladder and rectum are empty. If they are not, a catheter and purgative enemata must be used.

Excessive distention of the womb from dropsy of the amnion requires evacuation of the fluid by rupture of the membranes; distention from twins, delivery by forceps or version.

The effect of violent mental emotion can scarcely be ameliorated else than by moral persuasion, quiet rest, and perhaps a composing dose of valerian (elix. valerianat. ammon. gtt. xx), or one drachm of the fld. extr. of valerian. Any offensive person or thing should be removed.

Uterine feebleness from sleeplessness due to a prolonged first stage of labor requires a full dose of morphia (gr. $\frac{1}{4}$), or of chloral hydrate (gr. xx). The same remedies may be used with good results in cases where the pains become feeble from the woman having endured excessive suffering—the pains having been extremely "*painful* pains." The *cause* of the extreme pain should be found and, if possible, removed, before the anodyne is taken. The suffering may be mitigated by a little ether inhaled just as the labor pains begin.

Lateral obliquities of the uterus may be corrected by a finger hooked into the os, while pressure is made in the right direction upon the fundus. The woman should lie on the side opposite that to which the fundus is directed, so that the latter falls straight by its own weight.

Unusual resistance of "tough membranes," or adhesion of

the decidua to the uterine wall, must be remedied, respectively, by rupture of the sac, or by breaking up the adhesions with a finger.

A feeble, debilitated woman must have food (milk is best), and a moderate quantity of wine or alcoholic stimulant, given cautiously in small quantities at short intervals.

When the *causes* have been removed, the lazy actions of the uterus may be stimulated into more vigorous contractions by a warm vaginal douche, by introducing a bougie into the uterus, by dilating the cervix with Barnes's water-bags, and by the internal administration of sulphate of quinine in doses of 10 or 15 grains. The use of ergot is extremely questionable. It should never be given in primiparæ, nor in cases of mechanical obstruction. If given at all, it should only be in small doses of 5 or 10 drops of the fluid extract every half hour, and stopped as soon as uterine contractions have been reinforced. In cases where the inefficeint pains have continued long enough to produce exhaustion of the woman, or *commencing* exhaustion, delivery should be assisted by forceps or by whatever operative measures the stage of labor and nature of the case will admit.

In cases of *secondary* uterine inertia, in which the womb and woman are exhausted from fruitless prolonged effort, the best treatment is to restore the flagging powers by *sound sleep* produced by *full doses of opium*, morphia, or chloral. By sleep the nervous energies are restored, the pains are renewed, and *now* delivery should be hastened by forceps or other operative measures the existing obstruction may call for. If delivery by an operation should be accomplished while the uterus *remained soft, pliable*, and *inert*, post-partal *hemorrhage* would be almost sure to follow.

In cases of "*tonic contraction*," in which the womb retracts down upon its contents with continued persistent rigidity, and the woman is greatly exhausted, *delivery at once*, without any delay, is the only proper course to pursue, the method of proceeding depending, of course, upon the kind and degree of existing obstruction.

Powerless Labor practically means nothing more or less than the last stage of tedious labor, previously described. The powers of the woman and of her uterus are completely exhausted. Such cases should never be permitted to occur;

and scarcely ever would if "tedious" cases were promptly delivered before they become too far advanced, as above recommended. (See "Tedious Labor," pages 452–453.)

Precipitate Labor is one in which the child is delivered with unusual rapidity. It is of comparatively infrequent occurrence. The infant may be expelled unexpectedly, while the woman is standing or walking, and, as sometimes unpleasantly happens, in public places; or while she is at stool. The child may be injured by falling from the mother—such cases sometimes leading to underserved suspicions of infanticide. The umbilical cord may be ruptured in its continuity, or torn out at its junction with the navel, but the bloodvessels usually contract and prevent hemorrhage. The child may be born in its unbroken membranes, and drowned in the liquor amnii. Numerous alleged dangers to the mother may result from precipitate labor; but their occurrence is, on the whole, exceptional. These are: inertia and post-partal hemorrhage from sudden emptying of the womb; inversion of the uterus; syncope from abrupt reduction of abdominal distention; rupture of the uterus, laceration of its cervix, and of the perineum or vagina; procidentia of the womb.

Causes.—Unusually large size of the pelvis (pelvis æquabiliter justo-major). Unusual laxity and diminished resistance of the soft parts, as in cases of uncured extensive laceration of cervix uteri, the result of a previous labor. Excessive force and frequency of the pains, and of reflex contraction of the abdominal walls and diaphragm, generally due to peculiar temperament or nervous excitability of the woman.

Symptoms.—The pains come on with little or no warning, and are bearing down in character from the beginning, quickly succeeding each other, and rapidly progressing to very great intensity. In a large pelvis, or when the child is very small, labor may be terminated in a few minutes, without any *necessarily* over-violent pains. Violent pains and a large pelvis may, however, coexist. The child may be born during sleep, the woman dreaming she had colic. Intensity of suffering, on the other hand, may produce transient mania.

Treatment should be preventive in women who have previously had precipitate labor. It is liable to recur—certainly so when the pelvis is over-large. The woman should keep her room during the last week of pregnancy, and go to bed

on the first indication of labor pains, a competent nurse having been previously provided.

During labor, anæsthesia constitutes the readiest means of lessening undue violence of the pains. Opium internally; morphia given hypodermically, or by rectal suppositories, when there is time for them to act. Tepid enemata, to wash out the bowel, and an abdominal bandage have a soothing influence to some extent. The woman must avoid bearing down, as far as possible, by crying out, instead of holding in her breath during a pain; and everything likely to increase uterine contraction must be avoided. Procidentia may require a T-bandage over the vulva, an aperture being made in it through which the child may be born.

CHAPTER XXX.

DIFFICULT LABOR ("DYSTOCIA" FROM ABNORMALITIES OF THE MATERNAL ORGANS).

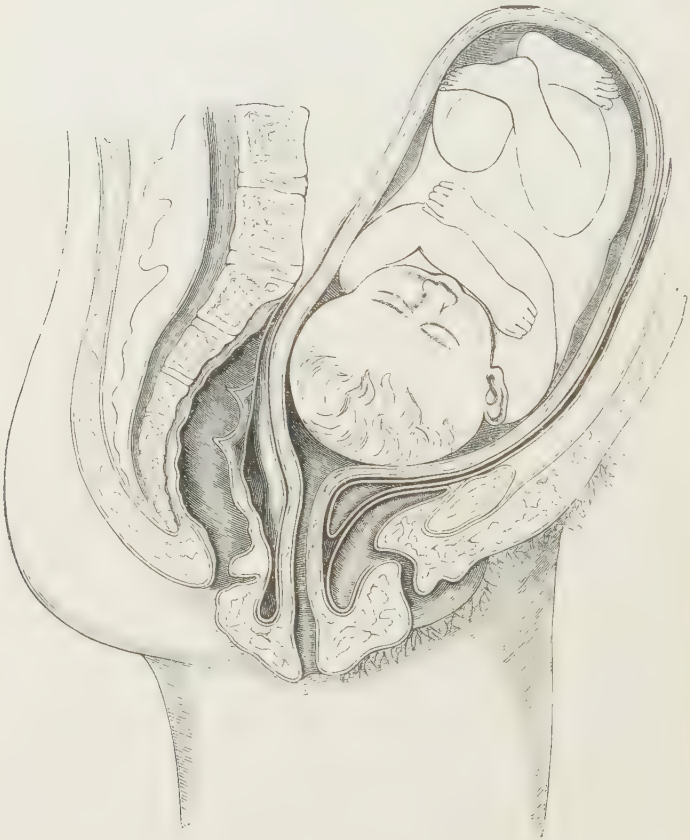
Deformities of the *pelvis* have already been considered (Chapter XXII., page 367). The present chapter refers to abnormal conditions of the *soft parts* producing mechanical obstruction in the parturient canal.

In quite *normal* labors there are *always* two barriers by which delivery of the child is *more or less* impeded: these are the *os uteri* and the *os vaginæ*. The degree to which these interfere with delivery largely depends upon the ease with which the two openings dilate. Hence a *rigid os and cervix uteri*, and a *rigid perineum*, which refuse to dilate before the pressure of the presenting part, may thus obstruct delivery.

Rigidity of the os uteri is either *spasmodic* or *organic*. *Spasmodic* rigidity occurs in highly nervous and emotional primiparæ most frequently; or may be due to premature rupture of the membranes; or to prematurity of the labor, in which last the tissues of the os and cervix have not yet undergone the usual softening by which their dilatability is increased; advanced age in primiparæ presents the same condition; the parts are less supple and dilate more slowly than in younger

women. Again, in conditions where the presenting part of the child cannot descend and fill up the os uteri (as in narrow pelvis or cross presentation) dilatation will be slow. In *most*

FIG. 210.



Elongated cervix with procidentia during labor. (BARNES.)

cases of *spasmodic* rigidity associated with an *un*ruptured bag of waters, labor is delayed not so much on account of the rigidity itself, as because of inefficient pains; that is to say,

if pains continue good and strong, almost any case of spasmodic rigidity will yield before them.

Treatment of Spasmodic Rigidity.—When the membranes are intact, time and patience usually remedy the difficulty; but in these cases, as in others where the membranes *have* ruptured, dilatation is greatly expedited by full doses of chloral hydrate, grs. xv, repeated every twenty minutes till two or three doses have been taken; or, instead of this, a full dose of morphia sulphate (gr. ⅛ to ¼) may be injected hypodermatically. Conjoined with the anodyne, a warm bath or hip bath of fifteen or twenty minutes' duration, or a douche of warm (not hot) water thrown against the cervix for a few minutes, contribute to relax the rigidity. Artificial dilatation with the fingers, or with Barnes's water-bags, is of service in cases where the natural bag of waters has been prematurely ruptured and the cervix is stretched tightly around the head. In cases where the membranes remain *un*broken artificial dilatation is probably useless, or worse.

Organic rigidity of the os and cervix uteri occurs from the development in the parts of fibrous connective tissue, the result of chronic inflammation, or the cervix is indurated from cicatricial—so-called "*scar*"—tissue following former lacerations, and this (still more rarely) is liable to be accompanied with *hypertrophic elongation* of the cervix and prolapsus.

Treatment.—Milder grades of *organic* rigidity may yield to the remedies just cited for *spasmodic* cases. Should these fail, and the conditions not admit of delay, the rim of the external os may be *incised* with blunt-pointed scissors or a probe-pointed bistoury, so as to make three or four notches, about a quarter of an inch deep, at different points. Barnes's dilators may be used *after* the incisions as well as *before* them. Absolute antiseptic cleanliness must, of course, be observed.

In cases of hypertrophic elongation of the cervix, with prolapsus or procidentia (see Fig. 210), incisions and mechanical dilatation will be necessary. Forceps may be used when the parts are sufficiently open, and delay becomes inadvisable from impending symptoms of exhaustion, etc. Cæsarean section has been advised, and might be justifiable under very urgent circumstances. When gestation, coexisting with elongated cervix, is made out soon enough, amputation of the hypertrophied neck may be done at the third month. It does not *necessarily* disturb pregnancy.

Rigidity of the Perineum.—The structures at the vaginal outlet, like those of the os uteri, must dilate to the extent of three or four inches in diameter before the head can pass. The resistance of a rigid perineum is more common in primiparæ, especially in those no longer young. Actual rigidity (except in cases with *organic* changes due to cicatricial tissue following the healing of former lacerations) is, however, more apparent than real. It is the *power*, not the *passage*—the *pains*, not the *perineum*—that are really at fault. It is an every-day experience to see the head come down to the perineum and stop there, perhaps for several hours. The pains fall off and become weaker and less frequent. There may be no mechanical obstacle to delivery besides resistance of the soft parts at the outlet. The usual reason of this delay is that the womb and the woman have been so far worn out by the preceding parts of the labor that the little additional effort necessary to force the child through the vaginal outlet is beyond their power. To use a figurative expression, the resistance of the perineum is "the last straw that breaks the camel's back."

Treatment.—When the head is thus arrested at the inferior strait, and there is no other mechanical obstacle to delivery but resistance of the perineum, the best method of treatment in the larger number of cases is delivery by forceps. While true that in a certain number of cases delivery would, in due time, spontaneously occur after some hours' further delay, provided the uterine inertia and general exhaustion were not excessive and there existed no absolute mechanical obstacle to delivery, experience has, nevertheless, amply proved that the required additional delay is *not to be depended on*, while delivery by forceps may be safely and often quite easily performed. The old maxim, "Meddlesome midwifery is bad," cannot be applied in these cases. Though delivery *might* in time spontaneously occur, the chances of final and rapid recovery, after labor, are far less than when forceps are applied *without* delay.

In place of forceps—as under circumstances where they cannot be obtained—delivery may be expedited by *manual pressure* upon the uterus (and thus upon the breech of the child) through the abdominal wall.

Manual pressure is simply a substitute for uterine contraction. It may be used to reinforce feeble pains or replace

absent ones; and must imitate them, especially as regards intermittence, duration, and force, as nearly as possible. Complete expulsion of the child, by pressure properly applied, has even been accomplished when the pains were entirely absent. It is applied thus: The patient lying on her back, spread the palms of the hands out over the sides and fundus of the womb, and when a pain begins make firm pressure, while it lasts, *downward* and *backward*, in a line with the axis of the plane of the superior strait. Lessen, and then stop pressing, as the pain goes off. If there be *no* pains, imitate them as nearly as possible. If the woman lie upon her side, one hand only can be used (the left, if she lie on the left side; the right, if on the right) to make pressure on the fundus, while the other guards the progress of the presenting part *per vaginam*.

Manual pressure must *not be employed*, of course, when the uterus is very tender on pressure, nor when it is spasmodically contracted round the child, nor when there is any mechanical impediment to delivery.

Sulphate of quinia, grs. xv, may be given to reinforce the pains; food and stimulants to relieve general exhaustion; and ergot to secure firm retraction of the uterus when labor is over.

Organic rigidity of the perineum cicatricial induration following healing of former lacerations may require digital dilatation, and, very rarely, incision of the resisting tissues episiotomy—as recommended to prevent rupture. (See page 215).

Besides resistance of *os uteri* and *perineum*, which are quite common, the more rare forms of obstruction by the soft parts may next be considered. These are:

Swelling and Œdema of the Anterior Lip of the Womb, from its getting pinched between the head and pubic symphysis. It must be pushed up with the finger-ends, and held there for several successive pains, until the head slip by it. If *much* swollen and appearing at the vulva, as may occasionally occur, pushing it up is impracticable. Deliver the child by forceps, or by whatever method may be necessary, without delay.

Imperforate Hymen.—An *absolutely* imperforate hymen would prevent impregnation; an *apparently* imperforate one

may contain a small, undiscovered opening, large enough to admit entrance of spermatozoids, and may thus afterward constitute an obstruction to delivery. The organ may be perforated with a visible round opening (*hymen annularis*) or with several small apertures (*hymen cribriformis*).

Diagnosis.—By impossibility of introducing finger, and by subsequent inspection of parts. Previous history of partial retention of menses.

Treatment.—Incision may very rarely be required.

Atresia of the Vulva may be partial or complete, resulting from inflammatory adhesion; healing of ulcerated surfaces following traumatic injury; or inflammation attending exanthemata, former labors, etc. It may be congenital.

Diagnosis.—By inspection.

Treatment.—Obstruction usually overcome by spontaneous dilatation during labor. Artificial dilatation by tents, or Barnes's dilators, or careful incision along the median line, while labia are stretched laterally, may be necessary.

Œdema of Vulva, when excessive, may require numerous small punctures for its relief, always preceded and followed by antiseptic cleanliness.

Atresia of Vaginal Canal may be *congenital* or *acquired*; *partial* or *complete*. Non-congenital cases are due to inflammatory adhesions following injury of former deliveries, pessaries, and other traumatic causes; or to inflammation of exanthemata and other constitutional diseases. Considerable surfaces may become adherent, or constricting cicatricial bands only exist.

Diagnosis.—By digital examination, or ocular inspection through speculum.

Treatment.—Artificial dilatation by elastic water-bags, tents, etc. Dissection through obstructing tissue with finger, or finger-nail, during labor pains, gradually executed with care not to penetrate vesico- or recto-vaginal walls. Shallow vertical incisions—longitudinal scarifications—for cicatricial bands; and careful vertical incision of central septum of adherence in bilateral union may be required. Finally, forceps delivery, to prevent prolonged compression of parts by fœtal head.

Vaginismus (spasmodic contraction of the vaginal orifice or canal), associated with spasm of the levator ani muscle, very rarely, may interfere with labor and require forceps or other artificial aid.

Cystocele—Prolapse of Vesico-vaginal Wall—may be due to, or associated with, retention of urine and vesical

Fig. 211.



Cystocele obstructing labor.

distention. (See Fig. 211.) The prolapsed wall presents a tense, fluctuating tumor, more or less occluding the vagina; it may be forced down by advancing head, or even ruptured.

Symptoms and Diagnosis.—Known existence of cystocele before or during pregnancy. History of urinary retention. During labor: intense pain; vesical tenesmus and dysuria. May be mistaken for bag of waters; diagnosticate by feeling presenting part above and *behind* bladder tumor, and by reduction in size of tumor by catheterism. Diagnosis from hydrocephalic head by same means, and by recognition of enlarged sutures, fontanelles, etc., of cranium.

Treatment.—Catheterism, which is difficult, and *may* be impossible, requiring puncture or aspiration through vesico-vaginal septum. Push back or hold up the prolapsed wall during pains, till the head slip by it.

Rectocele—Prolapse of Recto-vaginal Wall—is produced, much in the same manner, by distention of rectum by fecal contents, and pushing down of projecting recto-vaginal pouch by advancing fœtus.

Diagnosis.—By putty-like consistence of tumor, and indentation of its contents by digital pressure through recto-vaginal wall, or examination *per anum.*

Treatment.—Remove fecal accumulation by emollient enemata, or scoop out hard masses with spoon-handle or finger. Push back prolapsed wall while head passes by it.

Impacted Feces, without rectocele, may be sufficient to obstruct delivery.

Treatment same as above described. Prophylaxis by laxatives during pregnancy.

Vesical Calculus—Stone in the Bladder—when of considerable size may, very rarely, obstruct labor, and lead to cystocele, or vesico-vaginal fistula from compression of vesico-vaginal wall between calculus and fœtal head.

Diagnosis (from exostosis, etc.).—By mobility of calculus, felt *per vaginam*, between the pains, as a hard tumor behind and sometimes above the pubes, and by sounding bladder.

Treatment.—Lift the stone above the pelvic brim by digital palpation *per vaginam.* If this be impracticable, crush it, or extract through rapidly dilated urethra. If these be too tedious, perform vaginal lithotomy through neck of bladder. Vesical calculus recognized during pregnancy should be removed before labor.

Occlusion of External Os Uteri.—The lips of the os are either completely closed from former adhesive inflammation, or an observed or unobserved opening may exist of so small a size as to constitute *practical* occlusion so far as delivery is concerned. The adhesions may have followed traumatism of the parts from instruments used in producing abortion, or cauterization, lacerations, ulcers, etc.

Symptoms and Diagnosis.—Absence of the os on palpation and even on inspection by speculum. A circular dimple may be recognized where the opening ought to be. The cervix and internal os are widely distended, perhaps by the advancing head, their tissues being so thin as to necessitate care not to mistake them for the fœtal membranes; the recognition of their continuity with the vaginal wall would prevent the mistake. In uterine lateral obliquities and exaggerated ante- or retro-version, an existing os uteri may be tilted out of reach of the finger in ordinary vaginal examination, the os only being discovered by passing the whole hand through the vulva, and thoroughly exploring every part of the vaginal roof.

When occlusion really exists there is danger of rupture of the uterus, as well as of "tedious" labor, if relief be not afforded.

Treatment.—Make an opening where the os ought to be. Having found the circular dimple above stated, it may, if the obstructing septum be thin, be penetrated by pressure of the finger or finger-nail during the pains. Under other circumstances a small crucial incision must be made, preferably with a guarded bistoury, over the same spot, or, when no dimple can be discovered, over the most dependent point of the distended cervix. Tents and elastic bags may be necessary to complete dilatation if it fail to take place spontaneously. In a few cases, where no trace of the os could be discovered, Cæsarean section has been successfully performed.

Atresia of Uterine Cervix (within the external os) requires either vertical shallow incisions or gradual mechanical dilatation by laminaria tents and water-bag dilators.

Cancer of the Cervix Uteri.—When only involving the lower portion of the cervical canal, the diseased tissues will often yield enough to admit delivery. When extending higher up, the cancerous growth, by its size and want of

elasticity, either prevents passage of child, or ruptures with severe hemorrhage.

Prognosis.—Of course, most grave.

Treatment.—Incision of cervix, with application of perchloride of iron, or iodoform gauze, to stop bleeding. Perforation may be afterward necessary, if circumstances demand immediate delivery. Another plan, certainly preferable so far as the child is concerned, and, in bad cases, not adverse to the mother's interest, is to perform Cæsarean section as soon as labor begins. Masses of the cancerous growth may sometimes be broken away with the hand, making a sufficient opening to admit version, or forceps.

Cystic, Fibrous, and Cancerous Growths developed in Vaginal Walls may, very rarely, lead to sufficient obstruction to require operative assistance before delivery can take place. If small and removable, the growth should be removed. If not, and the tumor is hard and unyielding, craniotomy or Cæsarean section become last resorts.

Polypi of the Uterus—pediculated fibrous tumors—hanging in the parturient canal, may be of sufficient size to obstruct labor. (See Fig. 212, page 465.)

Diagnosis.—By their mobility—if not impacted—insensibility, pediculation, etc. Small ones might, without care, be mistaken for swollen scrotum of breech presentation.

Treatment.—Push the tumor up, out of the way, above superior strait, and retain it there till head take precedence in descent. When the pedicle is easily reached, remove the growth by *écraseur* or scissors. Some break off during labor, and come away of themselves. Some are sufficiently compressible as not to prevent delivery.

Fibroid Tumors of the Uterus—not pediculated—whether subserous, submucous, or interstitial, may or may not obstruct delivery, according to their size and position. If high up, above the superior strait, they produce no obstruction, but may render pains inefficient from asymmetrical uterine contraction, and predispose to ante- and *post-partal hemorrhage*, as well as to abnormal presentation and position of the child. Situated below the brim, in the lower segment of the womb, they necessarily obstruct labor, and may be large enough nearly to fill the pelvic cavity.

Diagnosis.—By history of the tumor, its slow growth and attendant symptoms before pregnancy, and by its firmness, want of fluctuation, etc.

Fig. 212.



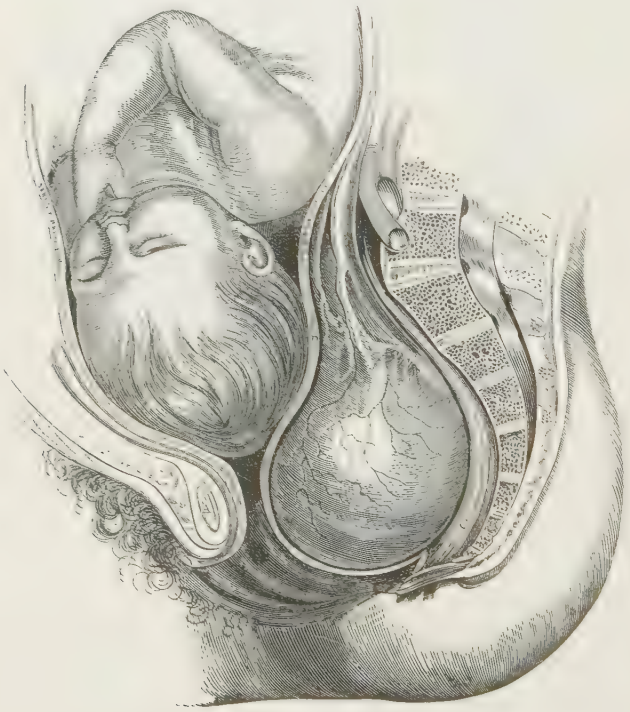
Polypus obstructing labor.

Treatment.—In all cases extra precaution against occurrence of post-partal hemorrhage. Applications of styptic iron solutions generally necessary to arrest it. Tumors *below* the brim, even in apparently very unpromising cases, may be pushed up *above* it by persistent pressure with the hand or closed fist, the patient being anæsthetized. The knee-elbow position may facilitate success. Surgical interference, enucleation of the tumor, or its removal with *écraseur*, when the base is not too

large, may be advisable. The only other remedies in bad cases are Cæsarean section and craniotomy. In a lesser degree of obstruction forceps or version may suffice.

Ovarian Tumors, whether solid or cystic, occupying the pelvic cavity, usually between vagina and rectum, may obstruct delivery. (See Fig. 213.)

Fig. 213.



Ovarian tumor in pelvic cavity obstructing labor.

The *degree* of obstruction depends upon the size, hardness, and position of the tumor, and upon its mobility. Apart

from obstruction there is danger that the tumor may burst during labor into the peritoneum and produce fatal peritonitis, or the pedicle may get twisted and break off. *Very* large ovarian tumors are less dangerous than medium-sized ones, because they are usually discovered before labor, and, further, because they are too large to get below the pelvic brim.

Diagnosis.—By the position of the tumor; by its fluctuation and consistency. *Fibroid* tumor of the ovary may, however, be so hard as to resemble bony growths of the pelvis; even cystic ones may be so tense as to require puncture with trocar or aspirator before their nature can be positively ascertained.

Treatment.—Attempt to push tumor above the pelvic brim out of the way. *Persistent* pressure, under anæsthesia, the woman being in a knee-chest position, may unexpectedly succeed. It may, however, fail, because tumor is adherent, or of large size, or held down by the presenting part of the child. Then puncture cyst through vaginal wall with trocar and canula, and retain until fluid be evacuated, and if fluid be too thick to flow readily, make digital pressure upon the tumor *per vaginam*. When no trocar is obtainable make a small incision in the tumor, and, after emptying it, stitch up the wound. Should puncture fail to remedy the difficulty, from the tumor being solid, the child must be delivered by whatever *obstetric operation* the space will allow, or, instead of this, the tumor itself must be removed by a *surgical operation*—vaginal ovariotomy. Most cases are relieved by puncture of the cyst.

The diagnosis of ovarian tumor having been made *during pregnancy* (*i. e., before labor begins*), it should be removed by abdominal section, as in other cases. The operation does not interrupt the pregnancy, if care be taken to handle the uterus as little as possible.

Hernia of Pregnant Uterus.—The varieties of hernia of the *non*-gravid uterus, named in the order of frequency, are: *umbilical, ventral, femoral, inguinal,* through the *foramen ovale,* and through the great *sacro-sciatic foramen*. All forms are rare; and for the uterus while thus dislocated to become *pregnant,* still more rare. Pregnancy has never been observed in uterine hernia through the foramen ovale or great sacro-sciatic foramen. *Inguinal, umbilical,* and *femoral* uterine hernias have been observed with pregnancy. The *inguinal*

and *femoral* cases always end in abortion or premature labor —the sac of an *umbilical* hernia may contain a uterus far advanced in pregnancy.

Diagnosis.—By absence of uterus from its normal situation, by shape and consistency of tumor, and evidences of its containing a fœtus. In inguinal and femoral cases the canal of the vagina is drawn on one side toward the hernia.

Treatment.—Replace womb and apply truss. If growth of pregnancy already too great for this, induce abortion or delivery. Growth may be so large as to require division of hernial ring to permit delivery. If this fail, hysterotomy.

Ventral uterine hernia with pregnancy occurs more frequently; is due to separation of recti muscles, or to dilatation of large cicatrix after laparotomy. Many of these are not *real* hernia—the sac being contained within the fasciæ—but ordinary "pendulous belly." If the woman, while on her back, attempt to raise the upper part of her body, the pregnant womb will protrude as a globular tumor in the linea alba.

Treatment.—An abdominal bandage. These *ventral* cases go to "term;" delivery not generally interfered with.

CHAPTER XXXI.

PROLAPSE OF FUNIS—SHORT OR COILED FUNIS.

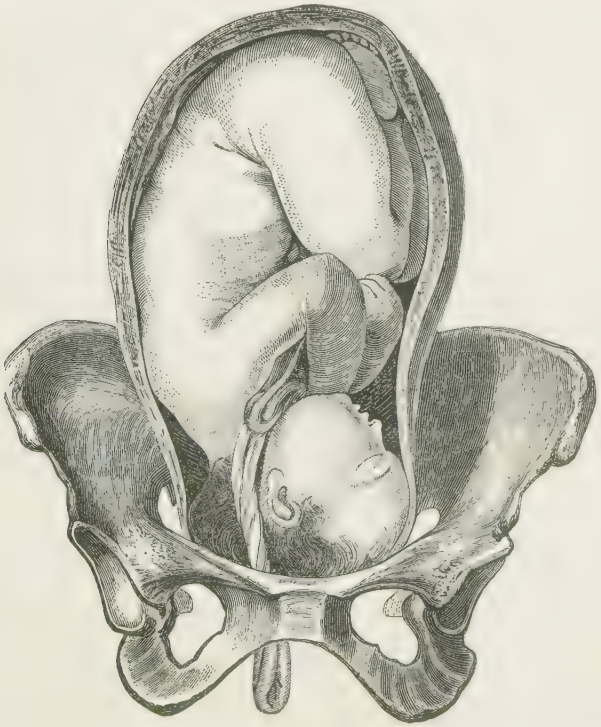
Prolapse of Funis.—A loop of the umbilical cord hangs down alongside of, or below, the presenting part of the child. *Before* rupture of the membranes it is called "*presentation*" of the funis; *after* rupture, when the loop falls down into the vagina, "*prolapse.*" (See Fig. 214, page 469.)

Causes.—Conditions in which the presenting part of the child does not completely fill, or block up, the ring of the os uteri and pelvic brim, viz., pelvic contraction or deformity; transverse, footling, knee, breech, and face presentations.

It may occur in ordinary head presentations, as well as under the circumstances just stated, from unusual length of the cord; insertion of placenta near the os uteri; excess of

liquor amnii, and gush of amniotic fluid when membranes rupture at the height of a labor pain; and in multiple pregnancy. Head presentation complicated with that of a hand or foot, or with both, especially favors prolapse of cord. From the far greater *relative* number of head presentations there are

Fig. 214.



Prolapse of the cord by the side of the head.

more cases of prolapsed funis associated with *them* than with presentations of other parts. But in a given *equal* number of each presentation, prolapse of the cord will be found least frequently with head cases, for the reason before stated. Thus Scansoni's figures are:

Funis presents once in 304 head cases.
" " " 32 face cases.
" " " 21 pelvic cases.
" " " 12 transverse cases.

Prognosis.—Not unfavorable to the mother, except in so far as may result from emotional disturbance and subsequent breast troubles from child being born dead.

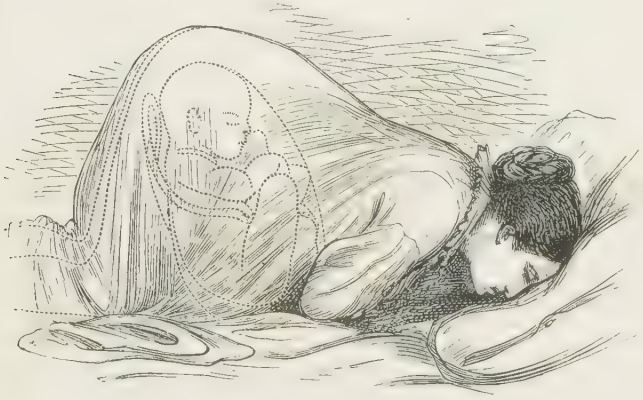
As regards the child, it is a most serious complication. About 50 per cent. die, owing to compression of funis during delivery. The dangers are less in proportion to the greater length of time that the membranes are *un*ruptured, and when the presentation and other conditions are favorable to rapid delivery *after* their rupture. Hence breech presentations, which admit of speedy extraction, are comparatively favorable. The breech, moreover, is softer and smaller than the head; hence there is less fear of fatal pressure on funis. Transverse cases do not necessarily involve pressure of the cord, and are less dangerous than head presentations *in this respect.* A large pelvis is favorable. *Un*favorable conditions are *primiparity* (owing to length of labor from resistance of soft parts), *contracted pelvis, low placental insertion,* and *early rupture of membranes.*

Diagnosis may be attended with *some* difficulty before membranes rupture, the finger having to feel the cord through them, or through the thinned uterine wall. It feels a soft, compressible, and movable body, in which pulsations, synchronous with the fœtal heart, may be recognized. Pressure of cord during a pain may temporarily interrupt pulsations. Pulsations in vaginal or uterine wall are synchronous with *mother's* pulse. Confounding fingers or toes of child with funis is avoided by remembering their harder consistency, number, and by absence of recognizable pulsations in them. In cases of uterine rupture a prolapsed coil of small intestine has been mistaken for funis. The attached mesentery, and want of pulsation in the intestine, are sufficiently diagnostic with ordinary care. When the membranes have ruptured, or the presenting cord has prolapsed into the vagina, there can scarcely be any mistake. Umbilical pulsation, of course, shows child to be alive, but the pulsation may cease some time before the infant dies; hence auscultate for heart-sounds before death is assumed to have occurred.

Treatment.—Preserve the membranes from rupture as long as possible. The cord is safer from pressure, when bag of waters is intact, than it can be made by any operative treatment after membranes rupture. One exception noted below.

Postural Treatment.—Before membranes rupture place the woman upon her side—upon the side opposite that upon which the cord lies—and elevate the pelvis upon pillows, while the head and chest rest low. The cord may thus gravitate toward fundus uteri during early part of labor. The knee-chest or knee-elbow positions are more effective, but difficult to maintain for any considerable time. (Fig. 215.) They should be

FIG. 215.



Postural treatment of prolapse of the cord.

resorted to at intervals during early stage, the woman afterward resuming her lateral position, as above stated. Later on, when the os is sufficiently dilated for the head to pass, the woman may be placed, temporarily, in a decided knee-elbow posture, when, if the cord slip back, the membranes are to be ruptured, and manual pressure applied externally to produce engagement of the head, which last fills the opening, and prevents reprolapse, the woman subsequently resuming and maintaining her latero-prone position.

Should posture alone not suffice to cause the cord to slip back, let the membranes remain intact.

When, finally, they rupture, artificial *reposition* of the cord must be attempted. There are several methods of operating, all of them being more likely to succeed when the woman is placed in the knee-chest position. The *hand* may be carefully passed into the womb with the loop of cord protected in its palm, until the loop is carried above the equator of the head to the back of the child's neck, the fundus uteri being meanwhile supported with the other hand, and the head gently pushed aside when the inner hand passes alongside of it. When this proceeding is inadvisable, or impossible, from the head having descended too low, two or three fingers may be used to push up the loop, and hold it above the equator of the head until the latter is forced down by a succeeding pain, when the fingers are withdrawn. Repeat during several successive pains, if necessary.

In lieu of the hand or fingers, various *repositors* have been devised. A tape and styletted male elastic catheter answer as well as any of them. A piece of tape three or four feet long is doubled, end to end, and passed into the catheter so that the tape loop can be drawn out an inch or two through the eye of the instrument. The stylet is also passed in, and its extremity made to project from the eye of the catheter. The loop of tape is next passed round the loop of cord, and hooked over the projecting end of the stylet, which last is pushed back into the eye, and shoved up quite to the closed end of the catheter. The two ends of the tape may now be gently drawn upon, until the loop loosely hold the cord in contact with the instrument. The prolapsed funis is then pushed up into the uterus by the catheter until it is quite above the presenting part of the child, when, by withdrawing the stylet, the cord is released. The catheter and tape may be left in till labor is over. A *simpler method:* The loop of tape, instead of being passed all through the catheter, is simply passed into the *eye* of it and over the end of the stylet, which last is pushed up to secure it; the free ends of the tape may now be loosely tied round the loop of cord and the catheter introduced as before, and stylet removed. (See Fig. 216.)

Or, again, a catheter may be used with *two eyes*, opposite each other; the loop of tape, or string, is passed transversely through *both* eyes, then round the navel-string, then over the end of the catheter (see Fig. 217), when the ends of the tape, passing along the shaft of the catheter, are drawn tight enough

to hold funis, etc. Stylet to be used for introducing it, and withdrawn afterward, leaving catheter, etc., in utero. A flat piece of whalebone, having an eye near one end, through which a loop of tape may be threaded, has also been employed in a somewhat similar manner, and, after reposition, left in till the child is born. Other methods of using the catheter,

FIG. 216.



Reposition of cord. (After WITKOWSKI.)

FIG. 217.



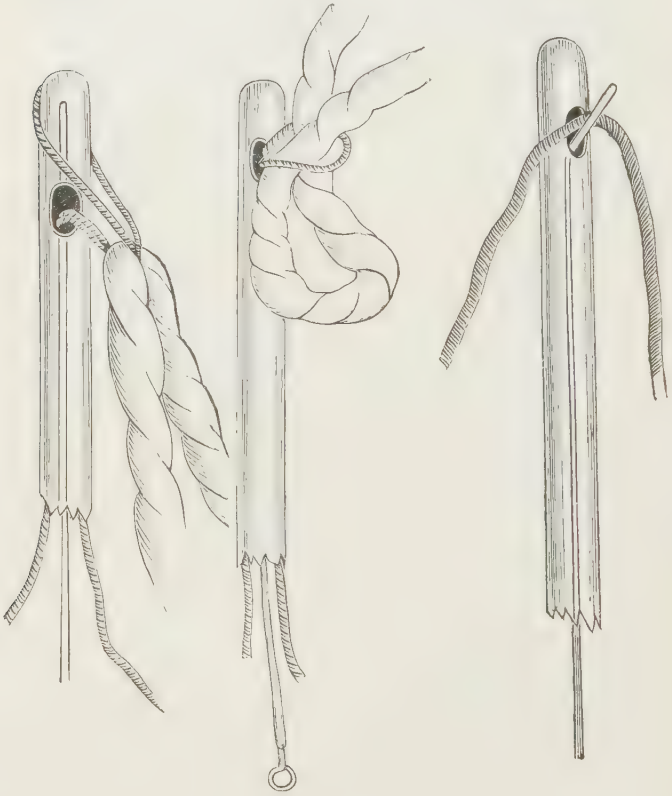
Braun's reposition of cord. (WITKOWSKI.)

tape, and stylet are shown in Figs. 218, 219, and 220, page 474, which explain themselves. Retention of a replaced funis has been secured by attaching to the cord a collapsed elastic bag or pessary, having a tube by which it may be inflated, after introduction into the uterine cavity—so-called "ballooning" the cord.

When reposition fails, as it is often wont to do, the next element of treatment, generally speaking, is *speedy delivery;*

or, when circumstances render this impracticable, it may be attempted to place the cord where it will receive *a minimum amount of pressure.* Thus, when the occiput is placed at one of the acetabula, the loop of the cord should be put near the

FIG. 218. FIG. 219. FIG. 220.



Other methods of reposition of cord.

sacro-iliac synchondrosis of the same side. In breech presentations put it near the sacro-iliac synchondrosis which corresponds to the antero-posterior diameter of the breech.

Speedy delivery may be secured by *forceps* when the os is dilated and the head sufficiently low.

When forceps are not available, the next alternative is *version by the feet*, preferably by external or by combined external and internal manipulation, and subsequent rapid extraction. The dangers of version, especially when the conditions for its easy and safe performance are not present, should, in the interests of the mother, be earnestly considered before the operation is agreed upon. It should be also ascertained that pressure upon the cord has not already so far injured the child as to render its chances of survival, after version, insufficient to justify any risk to the mother that may be incurred by the operation.

The operation of version, together with reposition of the cord, may be facilitated by putting the woman in the Trendelenburg posture.

In face presentations, when operative interference is decided upon to save the child's life, an *early* resort to version is the best, that is, when other methods of relieving the cord from pressure have failed.

In breech cases the extremities should be brought down, and the child rapidly extracted by the methods already stated. (See "Breech Presentations," pages 272–280.) Footlings the same.

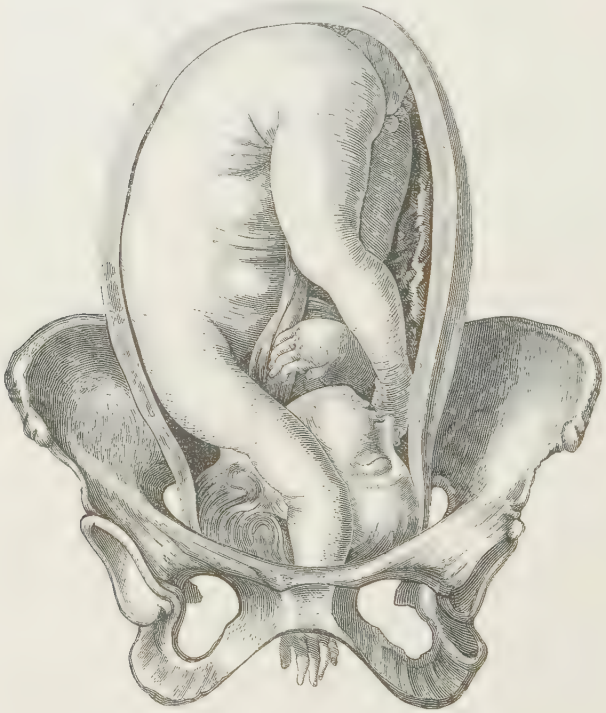
In cases of prolapsed funis associated with contracted pelvis or with transverse presentations, the treatment required for these complications, in the interest of the mother, must take precedence of that solely relating to the interests of the child.

When prolapsed funis is associated, in head presentations, with coincident prolapse of a hand (see Fig. 221, page 476), the prolapsed extremity should be replaced with the funis, and the head made to descend and fill up the space so as to prevent reprolapse. Care must be taken not to displace the head and thus produce transverse presentation; it is best prevented by abdominal pressure during the proceeding.

When a foot presents with the cord and head, or when foot, hand, head, and cord all present at once, it will usually be best to draw down the foot, while the head, cord, etc., are pushed up, thus producing version by the feet. Such presentations are technically known as "*complicated*" or "*complex*" ones; and are also so called when the cord does *not* prolapse. (See "Footling Cases," page 281). When the pelvis is large,

prolapse of a hand alongside of the head may still admit of spontaneous delivery, or forceps may be applied if the extremities cannot be replaced and progress is much impeded by the complication. When the child is dead, prolapse of

FIG. 221.



Hand prolapsed by side of head. The prolapsed cord is not represented.

the cord requires no interference. In all cases where hope of life remains, prepare beforehand for resuscitation by providing hot and cold water, brandy, electricity, etc.

SHORT AND COILED FUNIS.—*Actual* shortness of the cord (cases have been seen as short as two inches), or *artificial*

shortening, by its being coiled around the neck, body, or other parts of the child, very rarely offers *considerable* mechanical obstruction to delivery, and more frequently a *slight* prolongation of the second stage of labor results. Very long cords, of even six or eight feet in length (such have been observed), may be practically short, from coiling. From stretching of a short or coiled cord during labor there may result, though very rarely, inversion of the uterus, premature separation of the placenta and hemorrhage, rupture of the funis or interference with its circulation, and death of the infant.

Symptoms.—Before extrusion of the child's head, the diagnosis of a shortened funis is not always easy. The following symptoms may be present: a peculiar pain, or soreness, felt during uterine contraction, usually high up at the supposed placental site, which is described by multipare as being different from the suffering produced by ordinary labor pains. Later on there is partial arrest of labor pains, especially of bearing-down efforts; and retardation in descent of presenting part, with elastic retraction of it, between the pains, to a greater degree than can be accounted for by resistance of maternal soft parts. Blood may be discharged before birth, owing to partial separation of placenta, and when there are no coexisting lacerations of cervix, etc., to explain it. Depression of placental site, during pains, felt through abdominal wall.(?) An unusually persistent desire on the part of the woman to sit up, not occasioned by fulness of bladder or rectum. A finger passed high up may touch an existing coil.

Treatment.—None is required in the large majority of cases, other than release of a coil round the neck after the head is born. The coil is loosened by drawing it down to form a loop, which is then passed over the occiput. Harmless or at least remediable coils of this sort occur once in about every five labors. When the cord is too short to admit of release in this way, cut it, and deliver at once, to prevent the child bleeding and suffocating.

When labor is unduly retarded from a short cord *before* the head is born, let the woman assume a sitting or kneeling posture upon the bed, and lean forward during the pains. The whole womb is thus pushed down and tension of the cord relaxed, while the head, if its rotation have not previously taken place, will rotate, and so be prevented from re-

tracting between the pains, thus affording the succeeding uterine contractions a better chance of completing delivery. Should forceps be used in such cases, owing to symptoms of tedious labor, care must be taken not to invert the womb. A cord that is *very* short may require division, *in utero*, before the head can be safely extracted. Such cases are extremely rare. *Knots* in the cord do not impede delivery, but may interrupt the circulation, and thus destroy life of fœtus, when tightly drawn.

CHAPTER XXXII.

ANÆSTHETICS: CHLOROFORM, ETHER, CHLORAL. ERGOT, QUININE.

Anæsthetics are used in obstetrics to lessen suffering produced by labor pains; to lessen the pain attending obstetric operations; to relax the uterus when its rigid contraction interferes with version; to promote dilatation of the os uteri; to reduce excessive nervous excitement which may interfere with progress of early stage of labor; to relieve eclamptic convulsions and mania; to relax the abdominal wall and lessen pain, while the uterus is being pushed down; in cases of abortion when the finger is being introduced to remove retained secundines; in craniotomy to forestall unpleasant recollections; in cases of uterine inversion to relax the constricting cervix and so facilitate replacement; in bipolar version to lessen pain of introducing the hand into vagina; in precipitate labor to suspend action of voluntary muscles and retard delivery; to dissipate "phantom tumors" while making a differential diagnosis of pregnancy; to relax the os and cervix uteri while introducing finger to diagnosticate between uterine and extra-uterine pregnancy; in all cutting operations upon the abdomen; and sometimes in sewing up a lacerated perineum when many sutures are required. In this last instance, and in all cases when an anæsthetic is used *after delivery*, the greatest care is necessary, for the reasons, 1st, that the patient has usually lost some blood—perhaps a good deal; and 2d, the reduction of abdominal pressure after delivery allows blood to flow from the brain toward the abdo-

men, hence a liability to cerebral anæmia and syncope. Anæsthetics after delivery should be avoided if possible.

The practice of giving anæsthetics in *all cases* of labor, to lessen pain, has been warmly advocated in certain quarters, but is not, on the whole, advisable.

Complete anæsthesia from choloroform, or ether, undoubtedly *lessens the force of uterine contraction*, and thus retards labor, as well as predisposing to post-partal hemorrhage. Hydrate of chloral, on the contrary, may be given in sufficient quantity to procure relief from suffering without materially interfering with uterine contraction.

The choice between ether and chloroform—the two anæsthetics generally used—is unsettled; some prefer one, some the other. Ether is unquestionably safer; and while the advocates of chloroform claim that but very few deaths are *on record* from its use when administered with unremitting care and by the hands of an educated and experienced physician, yet these conditions cannot always be constantly assured. All men are human; the unremitting care will sometimes remit; oversights and diverted attention happen to all, and in obstetric practice, with its inevitable fatigue, loss of sleep, and anxiety, are more likely to happen than in other fields of professional work. Hence, as a matter of safety, I prefer ether. In cases of acute anæmia following profuse hemorrhage, all agree that chloroform is more dangerous than ether. Ether (sulphuric ether) may be safely given during the second stage of ordinary labor at the beginning of each pain, and during its continuance, and *should* be so given, to lessen suffering when the agony is severe and the patient particularly sensitive; but complete anæsthesia and insensibility are not advisable, from fear of post-partal hemorrhage, against the occurrence of which a double vigilance is always necessary when anæsthetics have been used. Ether is not so liable to retard labor from lessening the force of uterine contraction as chloroform, but it is not entirely free from this liability. It is objectionable during the early stage of labor, and is distinctly *contra*-indicated when there is kidney disease. Ether is inflammable, and hence care is required in using it at night.

Chloroform, when given to lessen the agony of labor pains, as it often is in Europe, though much less frequently in the United States, is usually administered when labor is

pretty well advanced—when the os uteri is well dilated, the head descending, and the pains are propulsive. A few drops are placed upon a handkerchief, and held near, not close to, the mouth, at the beginning of a pain, the inhalation being continued till the pain passes its acme, when it is at once stopped. Pure air should be breathed during the intervals. *Complete* insensibility is not desired; the woman should remain sufficiently conscious to converse. During the *early* stage of labor chloroform should certainly not be given merely to lessen pain. A mixture of one-third absolute alcohol with two-thirds choloroform is less objectionable than chloroform alone. All the uses to which chloroform may be applied in obstetrics may be attained by ether, with the exception that choloroform is better than ether when there is renal complication.

While it is generally admitted that chloroform is dangerous in cases of fatty heart and in cardiac valvular lesions, it has nevertheless been given in those cases without any apparent bad effects

During obstetrical operations requiring anæsthetics, anæsthesia should be complete; if it be only partial, the patient is liable to toss about without any control.

In delivering with forceps, under anæsthesia, extra care is necessary to avoid pinching the soft tissues of uterus and vagina in the grasp of the blades, since the patient, being insensible, cannot indicate, by her complaints, the occurrence of such a mishap.

Strong contractions of the uterus, rendering *version* extremely difficult and dangerous—or, perhaps, impossible—are at once relaxed by complete anæsthesia. The child having been turned, it should not be extracted until the womb has, at least in part, resumed its contractile efforts, so as to lessen the danger of hemorrhage.

When chloroform is given for puerperal eclampsia it should be administered just before the beginning of each returning paroxysm in time to prevent the seizure.

Chloral (hydrate of chloral) will probably, in great measure, take the place of chloroform and ether in obstetric practice, except when severe operations are required. Under its influence the woman may sleep during labor without any great suffering, being only aroused by the recurrence of pains,

the agony of which is not then acute. It is especially valuable, as already indicated, when the os uteri is thin, rigid, and difficult to dilate, in fact, during the early stage of labor, when ether and chloroform are inadmissible. Chloral does *not* diminish uterine contraction. It, indeed, lessens the *frequency* of the pains, but at the same time renders them *stronger* and *more efficient*, calms nervous excitement, and promotes dilatation of the os. Fifteen grains may be given in a little water or syrup of orange-peel, every twenty minutes, until two, three, or (possibly) four doses are taken, according to the degree of somnolence produced. More than a drachm during the whole labor is seldom required. Serious and even fatal symptoms have resulted from too large doses.

It is distinctly *contra*-indicated in *organic* cardiac lesions, and its safety is very questionable even in *functional* disease of the heart.

In puerperal eclampsia chloral is a most valuable remedy, both during and after labor. Large doses of twenty or thirty grains may be taken; or twice this quantity may be given at once, by enema, and repeated in a few hours if the spasms recur.

As a sleep-producer in puerperal mania chloral is better than opium, hyoscyamus, or any other narcotic. It may be combined, to advantage, with bromide of potassium (xv to xxx grains of each).

Bromide of Ethyl has been employed experimentally, of late, as an anæsthetic in midwifery. Its utility has not yet been sufficiently demonstrated to warrant its recommendation. It requires the same precautions as chloroform in its administration, and shares the dangers of this latter drug.

Ergot (Secale Cornutum, Ergot of Rye, Spurred Rye), though by no means allied, in its action, with anæsthetics, may be here considered as one of the obstetrician's special medicaments. Its effect on the uterus is exactly opposite to that of ether and chloroform, with which, indeed, it is sometimes administered as a sort of antidote to their relaxing effect upon the uterine muscles.

When given in ordinary full doses (xx–xxx grains of the powder, or xx–xxx minims of the fluid extract, or ʒj of the tincture, or wine) ergot produces, in the course of ten or fifteen

minutes, strong contractions of the uterus, which, when the drug is repeated so as to obtain its full effect, become *persistent* and *continuous* as well as *powerful*. This tonic and unremitting *persistence* of the contractions constitutes one of the chief drawbacks and dangers of ergot. If the child be still unborn, continuous pressure upon the cord, obstruction to the utero-placental circulation, and consequent injury or death of the fœtus may result, unless speedy delivery take place. Injury to the uterine wall from continuous pressure, or actual rupture of it may result, when there exists any mechanical resistance to delivery. Hence the following contra-indications to the use of ergot may be positively affirmed: pelvic deformity; malproportion between the size of the child and pelvis; transverse and other malpresentations or positions of the fœtus; undilated os uteri; resisting, rigid perineum. When powerful contractions are produced by ergot, as may happen from its injudicious administration by nurses and others, and the labor is *not* rapidly completed, forceps should be applied to relieve the child from danger—a procedure all the more imperatively needed if auscultation reveal irregularity or feebleness of the fœtal heart. On the whole, it is a safe rule to abstain from giving ergot at all before the child is born, except in retention of the after-coming head in breech presentations, as already explained. Its administration in certain cases of placenta prævia is generally recommended, as well as in accidental hemorrhage from separation of a normally placed placenta; but, if the child is to be saved, delivery must be expedited by every possible or practicable means. Ergot was formerly used to induce *premature labor*, but has now been abandoned for better and less dangerous methods.

The chief use of ergot in midwifery is to secure persistent uterine contraction after labor. It thus prevents hemorrhage and lessens tendency to after-pains.

Quinine (Quinia Sulphate), though not yet generally used in labor cases to reinforce feeble uterine contraction, has proved of sufficient efficacy in this respect to warrant the hope that it may form a safe substitute for ergot during the first and second stages of labor. Dose, x–xv grains every three hours. Its efficacy in relieving after-pains has been previously mentioned.

Recently, common *white sugar* in one-ounce doses, given in half a pint of water, every two hours, has been highly recommended to strengthen uterine contractions during labor in place of ergot. Its value has not yet been definitely proven.

CHAPTER XXXIII.

PUERPERAL ECLAMPSIA DURING LABOR.

Puerperal eclampsia, associated with *premature* delivery, due to uræmia, from albuminuria and renal congestion or inflammation during pregnancy, have been already discussed in so far as their etiology, symptoms, and *prophylactic* treatment are concerned.[1] Their *obstetric* treatment does not differ materially from that of eclampsia occurring during labor at term, here to be considered.

Puerperal convulsions during labor, besides arising from uræmia, may be due to other forms of blood-poisoning, viz., cholæmia (retention of bile; imperfect elimination of carbonic acid by the lungs; medicinal poisons, as lead, narcotics, etc.; septic poisons, as those of typhus and other fevers. The opposite conditions of congestion and anæmia of the brain may produce eclampsia; as may also general anæmia, plethora, hydræmia, and leukæmia. Convulsions often precede death from hemorrhage during labor. They may arise from violent emotional disturbance, or from reflex irritation due to indigestible food, fecal accumulations, a distended bladder, etc. The well-known increased excitability (so-called "convulsibility") of the nervous system in pregnant and parturient women predisposes to eclampsia from slight causes.

Symptoms and Clinical History. Previous occurrence of decided renal symptoms, general dropsy, etc., during pregnancy, especially signs of impending uræmia.

Preceding the actual occurrence of a spasm there are irritability of temper, slight or severe headache, dizziness, spots before the eyes, impairment or loss of sight, *tinnitus aurium*, hallucinations, deafness, intellectual disturbance, unusual de-

[1] See Chapter VIII., p. 141.

sire to sleep, with perhaps stertorous breathing, vomiting, etc. Some or all of these may be present.

The actual convulsion may resemble *epilepsy* or *hysteria*. Text-books give *three* varieties: epileptic, hysterical, and apoplectic. Hysterical attacks are slighter in degree, not accompanied with albuminuria, and consciousness is *not entirely* lost. *Apoplectic* ones are rare, and are followed by complete coma and paralysis, due to effusion, or a clot of blood within the cranium. The *typical* puerperal convulsion is *epileptic* in character. It begins with rolling of the eyeball, puckering of the lips, drawing of the lower jaw on one side, bending the head back or toward one shoulder. Then follow twitching of the facial muscles and of those of the extremities; protrusion of the tongue; grinding of the teeth; violent jerking of the arms; in fact, clonic spasm of the *voluntary* muscles, and some of the *in*voluntary ones, notably those of respiration; hence lividity of the lips and face, distended veins in the neck, and apparent impending cyanosis. At first, however, the respiration is hurried and irregular, hissing, through bloody froth, between the teeth. Urine and feces sometimes involuntarily discharged. Duration of the convulsion from one to four minutes. Complete unconsciousness during paroxysm, the patient having afterward no recollection of it. The fits may recur at varying intervals, of minutes or hours, and in varying number, from two or three to twenty, thirty, or more. They are apt to recur with the recurrence of a labor-pain. They sometimes come on *after* labor without having occurred before it. The uterus may participate in the spasm, and expel the child rapidly—an unusual occurrence, not to be anticipated or waited for.

Prognosis.—Always serious both to mother and child, increasing in gravity with the severity of the symptoms and existing impediments to speedy delivery. The convulsions may persist even after labor. Fortunately, they do not occur more than once in four or five hundred labors.

Treatment of Convulsions during Labor.—If possible ascertain the cause. A history of uræmia attends most cases, the treatment for which (purgatives, diaphoretics, certain diuretics, and methods of reducing renal congestion) has been already considered (Chapter VIII.). Should this treatment *not* have been previously employed, purgation may still be of benefit. A drop of croton oil, or a fourth of a grain of elaterin, may

be placed on the back of the tongue if the woman be comatose; or, if she can swallow, calomel and jalap may be given by the mouth.

The relief of convulsions, meanwhile, chiefly claims our attention. During the paroxysm, prevent the patient from self-injury, and place a piece of wood, or a spoon-handle wraped in flannel, or a folded napkin between the teeth, to protect the tongue from being bitten.

During coma, *following* the convulsion, the tongue sometimes falls *backward*, closing the glottis and threatening suffocation. Pull it forward with a tenaculum, or volsella forceps. When the fit is over the remedies are: in *decidedly plethoric* women, bleeding from the arm. It reduces cerebral congestion and vascular fulness—conditions indicated by a strong, full, bounding pulse and lividity of the face—and may prevent a fatal apoplexy. After bleeding, or when it is not deemed advisable, inject ½ grain of morphia hypodermically, and give full doses of chloral hydrate (gr. xv–xxx) every three hours. If the patient cannot swallow, inject the chloral into the rectum in doses of xxx grains. Anæsthesia with *chloroform* may be resorted to on the approach of returning paroxysms.

Recently the fluid extract of veratrum viride in large doses (10 to 20 minims), given *hypodermically*, has been successful in controlling the convulsions; the spasms cease to recur when the pulse is reduced to 60 per minute. One large dose (as above) is first given. This, or a smaller dose, may be repeated in thirty minutes, if required. When the pulse-rate has been reduced to 60, smaller doses of 5 minims may be continued, at longer intervals, to keep it so. The veratrum viride and morphia may be given *together* hypodermically, often with excellent results.

As a general rule, it is advisable to deliver by forceps as soon as dilatation of the os uteri will permit; but this is not by any means always required. Should the convulsions have been sufficiently controlled by other remedies, labor may go on and be left to complete itself, any violent efforts with forceps being liable to provoke a repetition of the eclamptic paroxysm. If the convulsions continue in spite of treatment, delivery offers the only port of safety. Then, if the os be not sufficiently dilated for forceps to be applied, it may be either incised or dilated with Barnes's bags, or by the fingers—the

former perhaps being, on the whole, preferable—though neither proceeding is universally commended, the other alternative, of version by the feet, being sometimes selected instead. Version, however, ought not to be attempted unless the conditions favorable for its easy performance are present. Anything like violent or prolonged manipulation during its performance would be almost sure to increase the convulsions. On the whole, most authorities consider version decidedly inadvisable, the conditions for its easy performance being seldom present. Whatever method of delivery be attempted, complete anæsthesia should be induced during the operation.

Much will depend upon the particular circumstances of each case and the judgment and skill of the operator. When circumstances render both forceps and version difficult and inadvisable, and the symptoms increase in severity in such a degree as to threaten the woman's life unless the delivery soon take place, craniotomy may be required. Such cases are very exceptional.

In a few cases Cæsarean section has been done, not only to save the child, but also in the interest of the mother. The results, while not altogether unfavorable, have not yet been sufficiently conclusive to warrant a decided opinion as to the advisability of the operation.

It is sometimes advantageous to rupture the membranes early, even before dilatation of the os, the pains afterward becoming more efficient, and the tendency to convulsions diminished, owing perhaps to consequent reduction in the size and weight of the uterus and in its pressure upon bloodvessels.

The hot, wet pack and vapor bath can be used to advantage, even during labor, and without interfering with its progress, retained urinary excreta being thus eliminated with the profuse perspiration that ensues, or an entire hot bath may be employed, as recommended in Chapter VIII., page 147; one or the other should be used *in every case*, the elimination of urea by the skin being of *extreme* importance. The use of *pilocarpine*, in doses of from one-sixth to one-third of a grain every two hours, given by hypodermic injection, to produce sweating, has been highly recommended, but it is not so safe as the hot bath, and is alleged to produce pulmonary œdema.

In puerperal convulsions *not* of uræmic origin, diligent inquiry must be made for other causes, and their removal attempted. Distention of the bladder and rectum, or a

stomach overloaded with indigestible food, may lie at the root of the disorder. Treatment accordingly.

Hysterical convulsions require valerian and other antispasmodics. Anæmic patients may need alcoholic stimulants, and afterward iron, food, and bitter tonics.

During third stage of labor the placenta must be delivered without delay; clots removed, and firm uterine contraction secured. Then, perfect rest in a dark room, cold to the head, laxative enemata, attention to the bladder, milk diet, and, if convulsions still continue, morphia or chloral as before. Subsequent renal disease may, exceptionally, require treatment.

CHAPTER XXXIV.

PUERPERAL SEPTICÆMIA.

PUERPERAL SEPTICÆMIA (*older* synonyms: childbed fever; lying-in fever; puerperal fever, etc.; *modern* synonyms: puerperal sepsis; puerperal infection, etc.) is a fever beginning within a week after labor—usually from the third to the fifth day, inclusive—attended with *septic infection* of the blood, and with *acute inflammation* of one or more of the *reproductive organs* (vulva, vagina, uterus, Fallopian tubes, ovaries) or their annexæ (cellular tissue and peritoneum), or of both. Other organs *not* belonging to the reproductive system, viz., the bladder, ureters, and kidneys; or, again, the other serous membranes—pleura, pericardium, and the synovial sacs of joints—may be *secondarily* inflamed also. Still, again, from the floating away and lodgement of infected emboli in remote organs, there may occur serious lesions of the heart, lungs, and other important structures. The *local lesions* are, therefore, extremely numerous and complicated. Nor is the *kind* of blood-poisoning always the same; sapræmia, pyæmia, septicæmia, one or all, may occur, alone or conjointly, in the same patient.

With this great number and variety of abnormal phenomena, local and general, and their tangled relations with each other, the pathology of the disease is difficult to understand. The different attempts thus far made to divide and classify the

various lesions into definite groups are none of them faultless, and some have resulted in producing a complex nomenclature that is very confusing.

The chief division of cases is made by separating those due to infection through the *lymphatics* from those due to infection through the *bloodvessels*. As might, *à priori*, be supposed, the two kinds of infection often coexist.

In *lymphatic infection*, inoculation takes place through lymphatic vessels, opened by wounds, of the genital canal, whence the streptococci make their way into the tissues, producing metritis, peritonitis, cellulitis, and various other local inflammations. The lymphatics themselves are enlarged and inflamed (lymphangitis); and eventually the microbes reach the blood, and so-called "*lymphatic* septicæmia" results. In *vascular infection*, inoculation takes place through the bloodvessels and blood, often beginning in clots (thrombi) formed in the mouths of vessels at the placental site. The thrombi break up and float away to form emboli in distant organs, which become inflamed, with consequent metastatic abscesses and pyæmia. The veins themselves are enlarged and inflamed (phlebitis), and eventually the infecting microbes produce general blood-poisoning, so-called "*venous* septicæmia."

A *third* form of septic infection (sapræmia) arises from absorption of ptomains due to putrefying materials in the uterus, without any entrance of microbes by either the lymphatics or bloodvessels.

All three conditions, viz, lymphatic septicæmia, venous septicæmia, and sapræmia, may coexist in the same patient. It is almost impossible to isolate the several forms of infection by diagnostic symptoms, and, if we could, the main principles of treatment would still be the same.

At present the entire subject is bristling with unsettled questions and theories, the invariable consequence of imperfect knowledge. With more light in the future, simplicity will doubtless supplant the present confusion.

There are, however, certain leading *facts*, easily understood and forming the foundation of our current knowledge of this disease, the comprehension of which will lead us to intelligent methods of prevention and cure. These will now be presented.

Causes and Origin.—Given ten lying-in women, whose labors may have been normal or abnormal, short or long,

simple or complicated, *five* of them make a good "getting up" and recover without a bad symptom; the *other five* are attacked with chills, fever, high temperature, profound general depression, and other symptoms of blood-poisoning, together with inflammation, ulceration, suppuration, sloughing, abscess, gangrene, or what not, of one or more of the reproductive organs (as before mentioned), while some of them die. What makes this *immense difference* in the two sets of cases? Simply that the *first* set, in which no bad symptoms occurred, escaped septic infection, while the *second* set *were* infected (really inoculated) with septic material containing pathogenic germs or microbes. (There may be cases—of pure sapræmia, for example, hereafter considered—which this statement will not cover; it, nevertheless, embraces the great majority of cases, and is the leading fact in our conception of the pathology and treatment of this disease.) The septic matter, with its pathogenic germs or microbes, *gains entrance* into the woman's body (into her blood or lymphatic vessels) through *wounds*, the wounded surfaces, inevitably present in all labor cases, resulting from *lacerations* of the genital tract—of the vulva, perineum, cervix uteri, etc. –together with the larger surface from which the placenta has separated. In some labor cases the lacerations mentioned are small, superficial, and insignificant; in others deeper and more extensive, and while the latter increase the danger the *smallest wound* (like the scratch of a pin or the puncture of a lancet, as in vaccination) may be amply sufficient to admit pathogenic micro-organisms whose rapid propagation, after admission, may be just as disastrous as if the wound had been larger.

What *are* these micro-organisms? We shall never see them at the bedside, and the part played in disease by the different varieties of microbes is still a matter of investigation by bacteriologists. There are, however, *two kinds* of organisms that concern us in puerperal fever, that act differently, and whose action helps to explain the differences observed in different cases of the disease. These are (1) *bacteria* and (2) *streptococci*. (The student is presumed to know that *bacteria* are rod-shaped bodies, called also bacilli, saprophytes, etc., and that *streptococci* are a variety of *micrococci* (dot-shaped bodies) in which the single points of several micrococci appear united in *chains* or wreaths.) In some cases staphylococci and other microbes may be found. But let us leave these out for the

present and consider *bacteria* and *streptococci* and their action. Bacteria are agents of *putrefaction*; without them putrefaction *cannot* occur; they attack *dead* tissues, such as bits of placenta, membranes, blood-clots, etc.; during putrefaction, *ptomaïns* are produced; these ptomaïns are absorbed into the blood and poison the patient, either mildly or fatally, according to circumstances. This form of blood-poisoning is variously called "sapræmia," "putrid intoxication," or "septic intoxication," and, since bacteria produce it, bacteria are called "*putrefactive germs.*"

Streptococci are agents of *infection:* they attack *living* tissues, produce inflammation and its various lesions and local death of parts in which they are greatly multiplied. Tissues that have thus been invaded, and we might say "killed," by the *streptococci*, *now* become a suitable soil for *bacteria*, with consequent putrefaction and ptomaïn-poisoning. Thus the two species of microbes are often found together. The streptococci, having once gained entrance to a freshly wounded surface, make their way—chiefly through lymph vessels and bloodvessels, but also through the finest lymph spaces between the tissue elements—to different parts of the body. Thus the various *local inflammations* result from *importations of streptococci*—at first a small community of microbes that soon multiplies into an invading army which destroys the tissues, and then come bacteria to distil ptomaïns from the "dead" left by the destroyer. Thus the streptococci (and their allies) are "*infective* germs;" the bacteria are "*putrefactive* germs."

From the action of these two sets of microbes all the numerous local lesions (inflammatory processes), and each of the several phases of general blood-poisoning attending this disease, may, in one way or other, be accounted for and explained.

It is unfortunate that recent text-books contain terms (based upon the different action of these two sets of germs) that are extremely confusing. Thus, we are asked to separate "general *putrid* infection" from "general *septic* infection;" and to remember that "*putrid* endometritis" is one thing and "*septic* endometritis" another. Yet the very derivation of the word septic is from the Greek $\sigma\eta\pi\omega$, to putrefy. Again, general *putrid* infection is called "sapræmia," and general *septic* infection is called "*septicæmia.*" In so-called "*putrid*"

cases, bacteria and their resulting ptomaïns are the active agents of disease; in the so-called "*septic*" cases streptococci are the factors of disease.

Where do the micro-organisms come from, and how do they obtain access to the woman's wounds? They come from without, and are introduced on the hands, instruments, and apparatus of physicians and nurses; on syringes, catheters, specula, sponges, cloths, napkins, bed-pans, etc. Anything, whether solid, liquid, or gaseous (as air), containing these germs, that comes in contact with the genital passage and its wounded surfaces, may lead to infection.

Since modern antiseptic midwifery has caused the hands, instruments, and materials, used in the lying-in room, to be sterilized—rendered aseptic—free from germs, this disease has been almost blotted out of existence even in maternity hospitals, where it used to be both frequent and fatal. But it still occurs, in private as well as in hospital practice, occasionally, either from faulty or neglected antiseptic management, or from unknown and unexpected sources of contagion that have consequently escaped detection and sterilization. The disease may be conveyed from an infected woman to a healthy one. Patients with erysipelas, diphtheria, carbuncle, and suppurating wounds are known to produce the pathogenic germs that in lying-in women lead to puerperal fever. Hence no obstetrician or nurse should go from these cases to attend a labor case. Physicians have themselves been known to infect women, by having at the time of their attendance, in their own persons, a muco-purulent coryza, a suppurative adenitis, and the remains of a dissecting wound. Physicians who dissect or make autopsies are liable to carry infection, at least from septic bodies, to their puerperal patients.

The air is sometimes the source of infection. It may be contaminated with microbes from other puerperal fever patients; the streptococci have been found in floating air dust Air may be rendered infective by sewer gas, by bursted waste-pipes, by the "contiguity of church-yards, dung-hills, privies, stables, slaughter-houses, cesspools," and many other places where the decomposition of organic matter is going on. A dead animal, even a rat or mouse in the wainscot, may cause a dwelling to swarm with infecting germs.

Most often the decomposing material in which the germs multiply is found in the uterine cavity itself, especially in

pieces of retained placenta, fœtal or decidual membranes, blood-clots, etc. Retention and decomposition of the lochia may also constitute a nidus for the development and multiplication of microbes. It is interesting to remember that the normal lochial discharge contains an abundance of *leucocytes*, which, it is well known, feed upon and destroy microbes (the process of "phagocytosis"); and in some cases of puerperal endometritis the microscopists have found just underneath the more superficial layer of necrotic tissue in the uterine cavity a (so-called) "granulation" layer, *swarming with leucocytes*, which acts as a protection and defence against the invasion of pathogenic germs. The result of this conflict largely depends upon numbers; the leucocytes may successively cope with a limited number of microbes and protect the woman from a fatal result, but should this limited number be multiplied ten million times the leucocytes are overpowered, and unless nature's little army of white blood-corpuscles be reinforced by the more sweeping germicides supplied by the obstetrician's antiseptics, a fatal result will often ensue.

Symptoms and Pathology.—These are mutually dependent and inseparable. The great number and variety of local lesions, the frequent coexistence of several in the same patient, and the varying kinds and degrees of blood-poisoning render the symptoms and pathology extremely complicated. In practice it may be impossible by any sort of examination to tell *exactly* the precise lesion or lesions existing in a given case. There are, however, certain broad distinctions, depending mainly upon the organs or structures affected, that are easily recognized, and the recognition of which is of practical use in outlining treatment. Some of the attempted more finely drawn distinctions are of little use, for, in many instances, after the most labored refinements of diagnosis, *treatment* remains the same.

Two *sets* of symptoms require to be noted, viz.: (1) *Symptoms of blood-poisoning*, and (2) *symptoms and signs of inflammation* and its results.

1. Symptoms of Blood-poisoning.—These vary in *degree*—in intensity—in different cases; may be slight or pronounced. The most impressive and best defined clinical picture of these symptoms is presented in cases of *septicæmia*

acutissima (acutest septicæmia, so-called by Garrigues), and in which the nervous system is so overwhelmed by the intensity of the blood-poison as to cause death within a few days. Symptoms are: chill, prolonged and violent; headache; fever; temperature rises to 104° or higher, but soon declines to *sub*normal. In doing so it must necessarily *pass* the normal point, hence, strangely, a temporary *normal temperature* may be present. The most notable and ominous symptom is perhaps the *extreme general depression*, indicated by *frequency* and *feebleness* of pulse, the rate being 120, 140, or even 160 per minute. Rapid respiration. Delirium, going on to stupor and coma. Anxious expression, sometimes with dusky or purplish color of the skin, and pinched features. Bowels loose, with thin, dark, offensive evacuations, that become involuntary. Tongue thickly coated; at first yellowish, soon becoming *brown* and *dry*. Spleen tender and enlarged. Urine scanty and loaded with albumin. There may be no swelling or pain in the abdomen. The lochia may be diminished or suppressed; sometimes horribly offensive; occasionally without odor. The uterus not well contracted, but soft, flabby, and large, with the os and cervix patulous enough to easily admit a finger. The symptoms begin soon after labor, and death usually occurs within twenty-four or forty-eight hours.

Few cases of this intensity occur nowadays. They were common enough years ago, especially during the endemics in lying-in hospitals, before the use of antiseptics, when the fatalities resembled those of plague, cholera, and other malignant diseases.

Note, once for all, that these symptoms, in *less pronounced degrees*, will be present in every case of puerperal infection. Especially to be noted is the *frequency and feebleness of pulse*, indicating general depression, which is often out of proportion to the other symptoms. Nervous symptoms—restlessness, delirium, somnolence, stupor, etc.—are always of bad omen.

2. Symptoms and Signs of Local Inflammation.—These, with their respective inseparable pathological tissue-changes, will be here arranged, according to the organs and tissues inflamed, in the following order: Vulvitis, vaginitis, metritis, salpingitis, ovaritis, cellulitis, pelvic peritonitis, abdominal peritonitis, pericarditis, pleuritis, pneumonitis, phlebitis, lymphangitis, etc.

Vulvitis and Vaginitis.—Symptoms are: redness, pain (tenderness and smarting when urine passes over inflamed surfaces), heat, swelling (sometimes *œdema* of vulva), and a muco-purulent discharge, just as in any other *catarrhal* inflammation. Retention of urine from swollen meatus or urethra. The superficial (catarrhal) inflammation may proceed to *ulceration* and *abscess*, or *sloughing* and *gangrene*, at once recognized by inspection of the parts. One form of the disease deserves special recognition, viz., *diphtheritic vulvitis* and *vaginitis*. Here the ulcerations (and lacerations, if there be any) are covered with a gray or grayish-yellow exudation (resembling the patches observed upon the throat and tonsils in diphtheria) and are accompanied with swelling and tenderness of the inguinal glands. The lochia are offensive and may be suppressed. The *general* symptoms will depend on the kind and degree of blood-poisoning, already considered.

Metritis (Inflammation of the Uterus).—Symptoms: Pain in and tenderness on manipulation of the uterus, which is found to be enlarged and softer than normal; after-pains very painful; lochia usually fetid and more bloody than normal. On vaginal examination, os and cervix uteri are hot, swollen, and tender to the touch. Various other symptoms occur depending upon the progress of the inflammatory process. The superficial (catarrhal) inflammation (endometritis) may proceed deeper until ulceration and sloughing occur, with offensive discharge containing pus and *débris* of broken-down uterine tissue; sometimes a whole slab or slice of muscular tissue sloughs off and is discharged (called "*dissecting metritis*") with an abundance of pus. The case may also become *diphtheritic*, with *gray*, scanty, and fetid lochia, and the appearance of diphtheritic patches upon the cervix, seen by examination through speculum. The pain may extend from the uterus down the lower limbs. Chill and fever are not very pronounced. A moderate rise of temperature at first is followed by a daily increase as the case proceeds from bad to worse. Bowels usually constipated, but there is little or no abdominal distention. The general symptoms of blood-poisoning will, of course, be more pronounced in diphtheritic cases and in those where the inflammation has extended deeply into the uterine walls.

Salpingitis (Inflammation of Fallopian Tube) and Ovaritis (Inflammation of the Ovary).—Symptoms usually follow or attend metritis, inflammation extending from uterus to tubes and ovaries. While there may be acute lancinating pain in the affected tube or ovary, these diseases are so often and intimately associated with metritis and localized peritonitis that it is almost impossible to isolate them during the puerperium. There is usually great tenderness over the inflamed organs, and their enlargement can be detected as a tangible mass high up in the vaginal fornix, usually on one side or above and behind the cervix, with the finger, on bimanual examination.

Cellulitis (Parametritis).—An inflammation of the pelvic cellular or connective tissue, between the uterus and peritoneum, extending between the folds of broad ligament and through the pelvic fascia in all directions. Symptoms: Localized pelvic pain in the neighborhood of the uterus, with scanty and offensive lochia, and moderate constitutional disturbance, headache, rise of temperature (not above 103°) and depression, preceded by mild chill or chilly sensations. The diagnosis is made by digital examination revealing a firm, hard mass (of inflammatory exudate), surrounding the cervix uteri, on one or all parts of the vaginal roof, which is tender on pressure, and renders the uterus more or less immovable. Later, the hard mass will either gradually disappear by *resolution* (leaving perhaps adhesions that produce permanent displacement of uterus and other viscera) or the exudation will break down into pus (suppuration), forming a pelvic abscess —the pus being liable to burrow in various directions before it finally makes its way out, to be discharged either externally just above Poupart's ligament in the inguinal region of the abdomen, or into the bladder, vagina, rectum, or at some other more remote point. When suppuration has taken place, the finger, *per vaginam*, will recognize softening and fluctuation in the hard masses of exudate, and the woman will have frequently recurring chills, fluctuating temperature, sweating, and all the symptoms of so-called hectic fever. The disease is extremely difficult to diagnosticate from, and is often coexistent with, pelvic *peritonitis*, next to be considered.

Pelvic Peritonitis (Perimetritis).—By *pelvic* peritonitis is understood inflammation of those folds or layers of

peritoneum covering or immediately attached to the uterus and other organs within the *pelvic cavity;* it is so called in contradistinction to general or *abdominal* peritonitis, by which we mean inflammation of those layers of peritoneum covering and attached to organs within the *abdominal cavity. Symptoms:* chill, fever, elevated temperature, sharp, cutting pain in *lower part of abdomen*, with tenderness on pressure over *same region*, and some slight tympany. Pulse moderately frequent (100 to 120), small and hard. Anorexia and thirst. Bowels constipated, but later become loose. Respiration somewhat accelerated. Lochia scanty, dirty in color, and sometimes offensive. Vomiting and hiccough, but not severe. After some days or weeks the lower part of the abdomen, on manipulation, presents an uneven hardness or distinct tumor, owing to the organization of inflammatory exudate having formed adhesions between the pelvic organs, matting them together in one mass. The exudation may disappear by *resolution* or go on to *suppuration* and form an *abscess*, the pus discharging much in the same manner as just described for pelvic cellulitis, and accompanied with the same chills, hectic fever, and local signs of pus formation.

General or Abdominal Peritonitis is one of the most common, severe, and fatal forms of puerperal inflammation. *Symptoms*: Severe chill lasting half an hour, or an hour, or even longer. High fever. Temperature 104°, 105°, or 106°. Pulse 120 to 160 per minute. Respiration accelerated (25 to 50 or more per minute), short and chiefly thoracic, owing to pain produced by movements of diaphragm. Decubitus dorsal with knees drawn up. Pain severe over entire abdomen, with extreme tenderness on pressure. Even weight of bedclothes, or the slightest vibration from jars or movements, may be painful. Facial expression anxious, pinched, and painful; corners of mouth drawn down; skin pale with dark line beneath lower eyelids. Thirst. Tongue dry, red on point and edges, becoming brown later. Vomiting, ejecta being green ("chopped spinach appearance") or even feculent. Diarrhœa preceded (probably) by constipation. Great tympanites. Lochia scanty or suppressed, and often offensive. Breasts flabby; milk arrested. Urine scanty and albuminous. Nervous symptoms begin with restlessness and insomnia, or somnolence and lethargy, and proceed to delirium, frightful

dreams, and sometimes stupor, etc. In the worse cases pulse becomes irregular, diarrhœa profuse, perspiration cold and clammy, and the abdominal pain may disappear while distention from inflated intestine still continues.

Pericarditis, Pleurisy, and Pneumonia.—These occur usually as secondary complications of peritonitis, or as the result of floating emboli dislodged from infected thrombi in the uterine or other veins. They are to be diagnosticated chiefly by the usual *physical signs* discovered on auscultation and percussion.

Phlebitis (Inflammation of Veins). *Uterine phlebitis*, inflammation of the uterine veins, and *crural* phlebitis, inflammation of the veins of the leg, are two forms of puerperal disease that require separate consideration.

Uterine Phlebitis usually arises from infection of clots (thrombi) in the uterine sinuses at or near the placental site, especially when contraction and retraction of the womb have been imperfect. Thrombi extend from uterine into other veins, or pieces break off, float away in the blood stream, and lodge in distant organs—in the heart, lungs, liver, spleen, kidneys, sometimes in the eyes, and frequently in the joints—leading to abscess in the organs.

Uterine phlebitis begins with chill, fever, elevated temperature, profuse perspiration, and is followed by other chills at irregular intervals. Pulse frequent—140 or 150; respirations 40 or 50; temperature 104° or more. There is no *great* pain or tenderness, although *slight* tenderness and a cord-like induration may sometimes be made out on one or both sides of the uterus by grasping it through the abdomen. The fever remits, and may on this account be confounded with malarial fever; in malarial cases, however, the remissions are *regular*, in phlebitis they are not. In phlebitis, when floating thrombi lodge in distant organs, chills recur at intervals; but the fever becomes continuous, and from the disintegration and liquefaction of other thrombi into a purulent fluid which mingles with the blood, the condition of *pyæmia* is produced, characterized by a yellowish color of the skin, sometimes pronounced jaundice, with vomiting, diarrhœa, headache, general depression, delirium, dry, brown, cracked tongue, with other typhoid

symptoms, and a curiously disagreeable "sweetish" odor of the breath. The urine becomes scanty and albuminous. Redness, pain, swelling, and pus-formations appear in the articulations — in the knee, shoulder, elbow, etc. — together with symptoms due to abscesses in various internal organs.

Crural Phlebitis (Phlegmasia Alba Dolens, or "Milk-leg") consists of inflammation of the veins of the lower extremity or those of the pelvis, accompanied with thrombosis and consequent obstruction of the vessels. In many instances it is accompanied with septic infection. The disease has been lately called "*peripheral* venous thrombosis," in contradistinction to "*central* venous thrombosis" or "heart-clot," with which it will be separately considered in another chapter (XXXV.).

Lymphangitis.—Inflammation of the lymphatic vessels and glands of the genital organs, while seldom recognizable as a separate lesion, being nearly always obscured by association with phlebitis and cellulitis, is none the less a most important and serious complication, being often the starting point from which follow inflammation of the serous membranes (peritoneum, pericardium, and pleura). The symptoms are difficult to isolate from those of phlebitis, and, could this be done, no practical result in the direction of *treatment* would be attained.

Various other Inflammations. — Endocarditis, hepatitis, splenitis, nephritis, cystitis, neuritis, proctitis, and some other lesions are mentioned in the larger text-books as occasional complications of puerperal fever, produced either by lymphatic infection or by lodgement of infected emboli, but their consideration belongs rather to the "*practice of medicine*" than "*obstetrics.*"

Prognosis.—This depends, *first*, upon the *kind* and *degree* of blood-poisoning, and *second*, upon the site, extent, and number of local inflammations. The "acutest septicæmia" is rapidly fatal in most cases. "Pyæmia" with its attendant metastatic abscesses is also extremely fatal. "Sapræmia"—putrid infection from ptomaïns, due to decomposing materials in the uterus—is sometimes at once relieved and proceeds to immediate recovery after the putrescent matters are removed

from the uterus. Combinations of "septicæmia," "pyæmia," and "sapræmia," of course, increase the danger. The degree of danger, from blood-infection, in individual cases, may perhaps best be indicated by the pronounced *frequency and feebleness of pulse* and the occurrence of *delirium*, *stupor*, *coma*, or other *nervous symptoms*.

Of local inflammations, the most rapidly fatal is general *peritonitis*. Pelvic peritonitis is less immediately dangerous to life; recovery is the rule, but exceptionally pus may find its way into the general cavity of the peritoneum and lead to fatal abdominal peritonitis. Cellulitis has about the same risks as pelvic peritonitis. Ovaritis and salpingitis usually end in recovery, or at least *partial* recovery (for such cases commonly become chronic ones, requiring removal of the diseased organs later on), but exceptionally pus from a diseased tube may find its way into the peritoneum and set up general peritonitis. The degree of danger in *metritis* varies with the extent of tissue involved—the prognosis must be always doubtful. In diphtheritic cases, in those accompanied with uterine phlebitis and consequent liability to embolic complications and pyæmia, the danger is great. The disease is liable to extend from uterus to peritoneum. Vulvitis and vaginitis, when existing alone, with proper treatment, usually end in recovery. There is, however, always danger of other organs becoming involved, which increases danger. In diphtheritic cases the prognosis is more grave.

Every case of puerperal infection and inflammation must be regarded with *apprehension*. However mild in the beginning, no one can safely say how it will end.

TREATMENT.—The *preventive* treatment consists in a rigid observance of antiseptic precautions in all labor cases, and especially in cases requiring operative proceedings. The lying-in room, the air, the clothing and utensils, all instruments and appliances, the physicians and nurses, must be uncontaminated with germs, or rendered thoroughly aseptic by the methods already described under "*antiseptic midwifery*" (Chapter XII., page 202).

The *curative treatment* will differ very materially in the different *local inflammations* and their progressive stages, but in the great majority of cases there are principles and methods of management that apply to nearly every case, whatever may

be the site, extent, or degree of local inflammation, or whatever the kind and degree of blood-poisoning. Two things at least are of the utmost value, and in their curative influence probably far outweigh that of all other remedies combined. These two things are: First, *thorough aseptic and antiseptic disinfection of the parturient canal, from vulva to Fallopian tubes;* and, second, *general support of the patient by food and stimulants.* This statement by no means detracts from the undoubted utility of such remedies as may be addressed to the *reduction of temperature*, the *relief of pain*, the *evacuation of pus*, or the *ablation of diseased organs* by surgical procedures and other measures; but *local antisepsis* and *general sustenance* apply to more cases and in the long run accomplish more good than can be credited to any combination of other curative agents. *Antiseptic disinfection* is accomplished chiefly by irrigating the vulva, vagina, and uterus with *antiseptic fluids*, by removal of septic masses with the *aseptic finger or curette*, and by the application of *solid antiseptics* in the form of *powders or suppositories.*

In irrigating the parturient canal the *vulva* and *vagina* should be *first* washed out, before the antiseptic solution is passed into the *uterus*, for the reasons that the vulva and vagina may be *infected* while the uterus is *free* from infection; hence by passing the nozzle of a syringe through an infected vagina into the uterus we should *carry* infection to the latter organ from the vagina. The solutions commonly used are the 2 per cent. creolin solution, the 5 per cent. carbolic acid solution, and the 1 to 3000 bichloride of mercury solution. Several pints of either solution should be prepared and introduced from either a fountain syringe or a Davidson's syringe, the nozzle being (preferably) a bent glass tube, with several openings on its sides, but none on the end, appended to the rubber tube. A bed-pan, or, preferably, a caoutchouc Kelly pad, receives the returning fluid, or a simple rubber cloth may be arranged under the woman's hips when she is brought to the edge of the bed, by which the fluid is conducted into a vessel on the floor. Irrigating the vulva and vagina is harmless and easy, but it requires to be done *thoroughly* by passing the syringe to every part of the vaginal canal. Irrigating the *uterine cavity* requires much more caution, and is not altogether free from danger—certainly not in *un*skilful hands. Care must be taken that no air be passed into the uterus by

letting the fluid run through the tube in a full stream so as to expel any air it may contain before the nozzle is introduced into the womb. Care must also be taken that there is ample room for the fluid to escape through the os alongside of the tube, as fast as it goes in; otherwise the fluid may be forced into the Fallopian tubes and peritoneal cavity, or the womb will be distended, producing "uterine colic." In septic cases the os and cervix uteri are commonly sufficiently open to easily admit the glass nozzle, and this last may be readily guided between two fingers of the left hand into the os and pushed with the other hand up into the cavity of the uterus without the aid of a speculum. The current—easily regulated by compressing the rubber tube—should first be slow, when, if it be seen to return freely, it may be allowed to run at full strength, while the distal end of the tube is directed successively to all regions of the uterine cavity. (The glass tubes made for this purpose have a little protuberance on one side of their circumference, near the end to which the rubber tube is attached, to indicate the direction of the curve at the distal end of the tube when it is out of sight in the uterine cavity.) During the irrigation, if the current should cease to return freely, the glass tube may be pushed gently from side to side or pulled forward toward the pubes, so as to stretch open the os a little or dislodge from it some piece of clot or membrane by which the returning stream is being obstructed. Irrigation of the *womb* should be done by the physician and not intrusted to the nurse, unless, indeed, she be known to have acquired the necessary knowledge and skill.

Use of the Finger or Curette.—When the uterus is suspected or known to contain tangible masses of putrescent or necrotic material that cannot be brought out by irrigation, such as bits of placenta, membranes, or anything else, these must be scraped out by the finger or curette. The woman should be anæsthetized, placed on her back, and brought to the edge of the bed. The *whole hand*, previously disinfected and lubricated with carbolized vaseline or mollin, is passed into the *vagina* and one or two fingers (rarely the entire hand) into the *uterine cavity*, counter-pressure being made over the fundus by the other hand upon the abdomen, when the fingers and finger-nails, inside, scrape off all adherent masses from the uterine wall and extract them. In case the uterus will not admit the fingers or hand, or when these for any reason are

insufficient, the long, dull curette (a sort of artificial finger) may be introduced and the uterine cavity thoroughly scraped, care being taken to avoid rough manipulation and consequent perforation of the uterine wall; and also to avoid leaving any recess, notably the angles of the uterus near the openings of the Fallopian tubes, unscraped. Should any remnants of adherent tissue be detected by the finger, the curette may be reintroduced and the mass scraped off. After all offending materials have been thus removed, the uterine cavity is irrigated with some antiseptic solution (creolin or bichloride) and packed lightly with iodoform gauze, or, instead of the gauze, a suppository (so-called bacillus of iodoform) may be passed up with a pair of long dressing forceps and left in the cavity of the womb. The suppositories are prepared as follows:

R.—Iodoform ℥v (grammes xx).
Gum arabic)
Glycerin) . . . āā ℥ss (grammes ij).
Starch (pure))
M.—Ft. suppos. No. iij.

These suppositories are about two inches long. They are passed into the cervix with forceps, and then pushed up beyond the internal os with the finger.

This antiseptic cleansing of the uterine cavity, if done thoroughly, may not require to be repeated. In many instances its salutary influence is so well marked that pain, fever, and elevated temperature are at once relieved. Should these symptoms continue, or return, the uterine irrigation may be repeated, and another suppository of iodoform introduced, and so on for several days if necessary. Antiseptic douching of the vagina should be repeated twice or thrice daily in all cases, or even more frequently. The temperature of the antiseptic solution (whether used for uterus or vagina) should be pleasantly warm (about 100° F.) in most cases; when, however, there is bleeding from the uterus, the fluid should be hot (100° to 115° F.). Hot solutions, unless necessary for their hæmostatic effect, are inadvisable on account of the smarting they produce.

General Support of the Patient by Food and Stimulants.—In all cases of blood-poisoning there is, as we have said in describing symptoms, great *general depression*, indicated chiefly by *frequency and feebleness of pulse*—a feeble *pulse* means a

feeble *heart*. The heart-action must be kept up temporarily and *directly* by cardiac stimulants (by whiskey, strychnia, digitalis, strophanthus, etc.), permanently and indirectly by nutritious and easily assimilable liquid food (by milk, beef-tea, beef-extract, and other meat broths and animal juices).

Of the alcoholic stimulants—whiskey, brandy, etc.—it is impossible to say how much will be required. In some cases astonishing quantities may be given without intoxication. One or two tablespoonfuls may be taken either with water or milk or in the form of eggnog, and repeated every three or four hours, to begin with, and the quantity and frequency of administration increased or diminished according to the effect produced and the requirements of the cases. Loquacity and undue exhilaration indicate that too much has been given. Returning strength and reduced frequency of pulse indicate, without any signs of intoxication, the desired result of a proper quantity. In place of, but preferably conjointly with, alcoholic stimulants, strychnia (gr. $\frac{1}{30}$), or digitalis (fld. ext. gtt. j–ij), or tinct. strophanthus (gtt. iij to v) may be taken every four hours. The sulphate of quinia, in five-grain pills, every four hours, is also useful both as a nerve tonic and to reduce temperature.

The liquid *foods*—milk and beef essence, etc.—must be given, at frequent intervals of one or two hours, in small (tablespoonful) doses, or more, as the stomach will bear. The more the better. If the patient have no desire for these things, they must nevertheless be taken, and at regular intervals, like medicines.

In addition to antiseptic disinfection, food and stimulants, *a laxative*, given early, when bowels are not sufficiently open, is advisable. Calomel, gr. v–x, with double the quantity of sodii bicarb., or castor oil, may be given *once*. Sluggishness of the bowels having been relieved, the laxative must not be repeated.

For the *reduction of temperature*, the best antipyretic is quinine, given in five-grain (or larger) doses, and repeated every two hours as long as the temperature remains above 101°; or phenacetine in five-grain doses every four hours; antipyrine (in doses of fifteen grains); salicylate of sodium (in doses of fifteen grains); carbolic acid, in doses of one minim, given every hour, in some demulcent mixture, have also been recommended. The antipyrine and salicylate of sodium are

objectionable, in that they depress the action of the heart. Of various local applications of cold, for the relief of high fever, sponging with cold (or cool) water and vinegar; or water with alcohol, or with bay-rum, and the wet-sheet or wet-pack, are the most available. Ice-caps to the head, ice-bags over the abdomen, cold baths (85° to 75° F.), cold effusion, even continued irrigation of the uterus or rectum with cold water, have been resorted to, but these last are of questionable utility. Cold water may be given to allay thirst as the patient may desire.

To *relieve pain*, morphia or opium may be given. If morphia depress the heart, each dose may be combined with atropine in doses of one-hundredth of a grain.

The general principles of treatment thus far given refer to all cases.

The variations of treatment required for special cases—for the various local inflammations—will now be considered.

Treatment of Vulvitis and Vaginitis.—Besides the usual antiseptic douches before mentioned, ulcerated surfaces should be dusted (after the douche) with iodoform or boric acid.

In *diphtheritic* cases, paint the patches with strong solution of silver nitrate (grs. xxx to water ℥j), or with a still stronger caustic (chloride of zinc and water in equal parts), or with tinct. iodinii comp. and liq. ferri persulphat. (in equal parts). When perineal wounds become infected their stitches must be removed and the surfaces remain open to allow thorough antiseptic irrigation and cauterization, after which pledgets of absorbent cotton soaked in a combination of oil of turpentine one ounce, to olive oil three ounces, may be placed in the wounds and changed three times a day.

Abscesses must be opened, washed out with antiseptic solution, and dusted with iodoform.

In diphtheritic cases *large quantities* of alcoholic drinks will be required as a part of the general treatment before described.

Treatment of Metritis.—This consists chiefly in thorough antiseptic cleansing of the uterine cavity by *irrigation* and *curettment*, etc., as already described (see page 500). So long as the inflammation remains superficial—*i. e.*, affecting chiefly the endometrium—this treatment, together with cold compresses, or ice-bags placed over the uterus just above the pubes (which restrain inflammation and lessen pain), may suffice. Diphtheritic cases require cauterization of the diseased patches

with silver nitrate or zinci chloridi, as in diphtheritic vaginitis. A speculum must, of course, be used, and the cervix cauterized from the external to the internal os. General treatment by food and stimulants as a matter of course.

In cases of metritis involving the muscular walls of the womb, with formation of pus foci, and purulent infiltration in various parts of the organ, the only hope appears to be the *early* performance of *hysterectomy*—extirpation of the diseased uterus by abdominal section.

It is unfortunate that the necessity for so serious an operation is difficult to make out—at least in many cases—before it is too late to prevent a fatal termination.

Treatment of Pelvic Cellulitis and Pelvic Peritonitis.—These two inflammations—so frequently associated—require about the same treatment, viz., application of ice-bags or of cold compresses (towels wrung out of cold water and covered with oiled silk or some other water-proof material and changed every four hours) to the lower part of the abdomen. In cases of great depression or diarrhœa, *hot* flaxseed-meal poultices, in place of the cold application, hot vaginal douches (110° to 115° F.), continuously for fifteen or twenty minutes, thrice daily. Opiates to relieve pain. These remedies are supposed to control or restrain acute inflammation. To promote absorption of the inflammatory exudation later on, *iodine* is most potent. Paint lower part of abdomen and vaginal vault with tinct. of iodine at intervals of two or three days, and give iodide of potassium, gr. v, three times a day. Ointments of iodine, of mercury, ichthyol, and belladonna are applied to the abdomen for same purpose. In case *suppuration* occur, the abscess must be opened (the presence of pus having been previously rendered positive by the use of an exploring needle), either externally above Poupart's ligament or through the vagina. Cavity of abscess to be douched out with antiseptic solution, twice daily, and drainage secured. In opening abscess through vagina, feel for and avoid uterine and vaginal arteries; the ureters may be avoided by cutting *posterior* to an imaginary line drawn *transversely* through the cervical canal.

In all cases antiseptic irrigation of vagina; food and stimulants as circumstances require.

Treatment of Abdominal (General) Peritonitis.—At the present date this is quite unsettled. There are those who believe that *every case* of abdominal peritonitis, or of pelvic

peritonitis, when it *extends* from the pelvic to the abdominal peritoneum, should be treated *surgically*, by opening the abdomen, flushing out the peritoneal cavity with hot water or saline solution, drainage, etc Those with a more conservative surgical bias would limit cœliotomy to "*suppurating* peritonitis," so-called, or to cases in which there is pyosalpinx or some other collection of pus, bursting, or threatening to burst, into the peritoneal cavity.

Others, who have seen cases of general puerperal peritonitis recover without cœliotomy, trust to non-surgical treatment, viz., application of ice-bags, or of a rubber coil with ice-water running through it, over the abdomen. With any contraindication to *cold*, an exactly opposite plan (viz., *hot* poultices of flaxseed meal) is adopted. Opium is given in large doses—in almost incredible quantities—the so-called "*opium treatment*" of peritonitis. It is advocated by some, condemned by others. Two or three grains of opium—or an equivalent of morphia—are taken every *two hours* until the patient is so far narcotized that the *respirations* are reduced to 12 per minute, at which point the breathing may be kept by regulating the doses and frequency of administration. Among recent advocates of this treatment, Dr. Garrigues claims to have saved one-half of his cases of general peritonitis by the "opium plan." He gives one-eighth to one-quarter grain of *morphia* every *half-hour* until the respiration is reduced to 12, as before stated. The treatment is continued days and even weeks if necessary.[1] If morphia depress the heart, atropine is added, thus:

℞.—Atropinæ sulphatis gr. $\frac{1}{8}$.
Liquor morph. sulphat. (Magendie) ℥ij.—M.
Sig.—Four to eight minims as prescribed.—Garrigues.

Whiskey, milk, beef-tea, etc., are given plentifully at the same time with the opium. The bowels to be moved occasionally by enemas of glycerin or of castor oil, with oil of turpentine if they do not act spontaneously.

Opium, if not given in large quantities on the "opium plan," may be taken to *relieve pain*, in doses necessary for that purpose. For the relief of *tympanites* oil of turpentine,

[1] Dr. Alonzo Clark gave 934 grains of opium in four days; Dr. Fordyce Barker, 13,969 drops of Magendie's solution in eleven days; Dr. Lusk, 1700 grains of opium in seven days; Dr. Garrigues, 216 grains of *morphia* = 1296 of *opium*, in twenty-three days. Lusk, p. 695; Saunders, p. 728.

fifteen to twenty drops, may be taken in mucilage. It is, moreover, a cardiac and nervous stimulant. To relieve vomiting, cocaine, gr. $\frac{1}{4}$; or dilute hydrocyanic acid, in two-drop doses, will be of service.

In addition to antiseptic irrigation, stimulants, food, antipyretics, and anodynes (used in all cases of puerperal infection), there remains, in *general peritonitis*, only the application of either ice-bags or hot poultices to the abdomen, and the choice between *medical treatment* on the "opium plan" or *surgical treatment* by cœliotomy.

Treatment of Uterine Phlebitis.—Here, again, it is the same old story of stimulants and food and antiseptic irrigation of the parturient canal. With regard, however, to *uterine* irrigation and *curetting*, the question arises whether serious harm may not be done by this treatment. The *vagina* may and certainly should be douched with antiseptic washes, but douching and curetting of the *uterine* cavity may displace thrombi from the placental vessels and inflamed veins, and so start off floating fragments to lodge in distant organs and produce metastatic abscesses and pyæmia, which is the great danger. Hence some advise that the intra-uterine douche and curette should be *strictly avoided*. A very *gentle* use of the intra-uterine antiseptic douche would, however, be justifiable when the uterus is known to contain putrescent matters. The curette may profitably be avoided. An iodoform suppository, and, in case of hemorrhage, the tampon of iodoform gauze, may be used in the uterus, provided the manipulation be carefully and gently performed.

In cases of metastatic abscesses in the articulations and viscera and of pyæmia, one of the most important general remedies is *iron*, especially the tinct. ferri chloridi in doses of twenty or thirty drops, three or four times a day, with quinine, stimulants, and food.

Abscesses in the viscera are usually beyond remedy. Those in the joints require incisions for the evacuation of pus, antiseptic douching, dressing, and drainage, in accordance with surgical rules.

Treatment of Lymphangitis.—The same as for uterine phlebitis. In cases of suppuration and abscess, the same as for suppurating cellulitis. Lymphangitis of the vulva, when not deep-seated, may be benefited by the constant application of compresses wet with the lead-and-opium wash. In the general

treatment alcoholic drinks and feeding are of paramount importance. Antiseptic cleansing of genital canal as a matter of course.

Treatment of other Puerperal Inflammations.— Pleuritis, pericarditis, pneumonitis, hepatitis, splenitis, and endocarditis may be treated as in non-puerperal cases, with the addition of antiseptic cleansing of the parturient canal, together with alcoholic stimulants and food to combat the septic poison. *Cystitis*—usually produced by infection from an unaseptic catheter—requires the bladder to be washed out with mild, warm solutions of creolin (1 per cent.), or of boric acid (20 per cent.), twice or thrice daily. Frequent micturition to be relieved by suppositories of morphia. Extension of the disease to ureters and kidneys requires disinfection by boric acid solution through ureteral catheters, and sometimes when infection has invaded the substance of the kidney nothing but incision of the renal pelvis and drainage, or, if one only be infected, extirpation of the diseased organ, will be of service. As in the renal troubles of pregnancy, so in puerperal cases, a *milk* diet and a free action of the bowels and skin will help to cure.

New Remedies.—Recently three new remedies have been used in the treatment of puerperal septicæmia, viz.:

1. Nuclein.
2. Hypodermoclysis of normal salt solution.
3. Antistreptococcic serum.

1. Nuclein (nucleinic acid) is supposed to increase the number of leucocytes in the blood. These leucocytes feed upon and destroy bacteria and other pathogenic microbes with which the blood may be infected. It is given hypodermatically, a 5 to 10 per cent. solution of the drug being used. The skin surface to be punctured is rendered aseptically clean by a 1 to 1000 solution of bichloride of mercury or a 5 per cent. solution of carbolic acid. The syringe is boiled for five minutes before being used. The puncture is made between the scapulæ or on the outer surface of the thigh, or into the gluteal region. Dose of the solution (just named) 10 minims, gradually increased 5 minims for each successive dose until 60 or 80 minims are given daily. It is also given in similar quantities by the mouth. Tablets of proto-nuclein, each containing 2 grains, have also been prepared, of which one may be taken every two hours.

Besides promoting phagocytosis, by increasing the white *corpuscles* of the blood, nuclein is also believed to increase the antitoxic and germicidal properties of the blood *serum*.

It has been used in cases of puerperal septic infection with apparent benefit, but always in *conjunction with other remedies*, so that its *individual value* as a curative agent cannot be definitely stated. It is, however, harmless, and there is sufficient evidence of its good effects to warrant its employment as above stated.

2. *Hypodermoclysis of Normal Salt Solution.*—The saline solution[1] is injected subcutaneously (with strict antiseptic precautions as to instruments and skin surface to be punctured) in quantities of from one to six pints. A large aspirating or exploring needle is plunged under the skin, usually in the subclavicular region, or under the mammary glands, or in the gluteal region. The needle is joined by a rubber tube to a glass vessel or rubber bag containing the solution of salt, thus the fluid is slowly transfused into the cellular tissue. The temperature of the solution should be 100° F.

It is supposed to act, like nuclein, by increasing the white cells of the blood, and by its rapid absorption, and subsequent excretion by the kidneys, is believed to promote the elimination of toxins from the blood. It is also in some sense a nutrient and support to the heart and general system. It has only been used *with other remedies*, so that its actual curative power remains to be determined. It may, however, be regarded as an eligible addition to our former recognized methods of treatment.

3. *Antistreptococcic Serum* (*Streptococcic Antitoxin*).—This preparation is the blood serum of animals (horses and asses) that have been rendered immune against streptococcic poisoning by repeated artificial infection with cultures of the streptococcic microbes. It is made about on the same plan as that by which the antitoxin of diphtheria is produced.

It is given, always hypodermatically, always with rigid antiseptic precautions, in doses of, usually, 5 to 10 cubic centimetres (approximately 81 minims to f℥ijss), once, twice, or thrice daily, but much larger doses—20, 30, and 35 c.c.—have been given at once in some cases, and in others the smaller doses of 5 or 10 c.c. have been repeated every two or

[1] For its preparation see p. 148.

three hours. The size of the dose will depend, *first*, upon the *strength* of the preparation (for which we have to rely *entirely* upon the statement of the manufacturer);[1] *second*, upon the severity of the case, larger or smaller doses being used according as the symptoms indicate, respectively, a very virulent or mild degree of infection to be overcome. Again, when symptoms abate, the serum may be omitted, or used in smaller doses; when symptoms return the larger doses must be resumed.

In some cases the serum has apparently had a most marvellous and satisfactory curative power. When temperature has been very high, with frequent and feeble pulse, suppression of milk and lochia, delirium, dry, brown tongue, sordes on the teeth, offensive breath, and every indication of a fatal termination, after *one injection* of the serum, the bad symptoms have *all abated within twenty-four hours*, and the case gone on to uninterrupted convalescence and complete recovery. Such a good result is not always obtained, by any means. The remedy must be *used early*, before the various inflammatory lesions—especially pus formations—have had time to proceed beyond recovery.

In other cases good results have *not* been obtained, even though the serum *was* used early. In some this is accounted for by the complication of a mixed infection—some other infection besides that with the streptococcus, such as, for example, the staphylococcus, or the bacillus coli communis, or the gonococcus, or the bacillus of diphtheria. In puerperal cases due to diphtheritic infection, however, the subcutaneous injection of diphtheritic antitoxin has sometimes been followed by the same beneficent curative effect observed to follow the use of streptococcic antitoxin in streptococcic infection. In short, the antistreptococcic serum will only be of service in streptococcic infection, and the diphtheria antitoxin only in diphtheritic infection. For cases of mixed infection, a mixed serum, not yet devised, would seem to be required.

[1] In the cases thus far reported, Marmorek's serum, made by Dr. Alexander Marmorek, of Vienna, and that prepared at the "British Institute of Preventive Medicine," have been mostly used. The serum is, however, now prepared in this country by Parke, Davis & Co., of Detroit, Gibier & Co., of New York, and some other manufacturers. The process is a delicate and complicated one. A horse is said to require treatment for several months—sometimes for a year—before its blood-serum will become suitable for use. The efficacy of any preparation must largely depend upon the method of production, as well as upon the age and preservation of the product afterward.

Until we have learned to distinguish the various kinds of infection by *clinical symptoms*—a consummation not yet attained — we must ascertain the *kind* of infection by a so-called "*bacteriological diagnosis.*" *This is a necessity* in order to use the serum advisedly. But it requires *time.* A cover-slip preparation may be made by *an expert* in fifteen minutes; a culture tube preparation requires at least twenty-four hours, but both methods require special skill and apparatus.

At present it is not known whether the antistreptococcic serum acts as a germicide by killing the streptococci themselves, or as an antidote to the toxin produced by them, or in both of these ways. Yet if it cure the patient, that is the main point, whatever may be its *modus operandi.*

It is not justifiable at present to use the serum alone, to the exclusion of other remedies. Antiseptic douching of the genital canal, alcohol and other cardiac stimulants, with support of the patient by nutrients, have been and *should be used* in conjunction with the serum therapy. So, too, the administration of nuclein, and subcutaneous injection of the salt solution, have been and *should be* used conjointly with the serum.

Under these circumstances the individual value of the serum-treatment, taken *alone*, remains to be determined. In some cases where it has been used, *no* benefit has resulted; some have grown *worse*, while in others decidedly unpleasant symptoms—notably hæmaturia and cardiac depression—have been produced; while in a few cases death—apparently from rapid collapse—has been directly ascribed to the serum-treatment. It should not be used when there is renal disease, and in cases of simple sapræmia, or putrid intoxication, it would do harm rather than good.

Finally, it should be remembered that about *four-fifths* of all cases of puerperal septicæmia recover anyhow, under the treatment of stimulants, food, and antiseptics, so that further experience is needed to demonstrate the *superiority* of the serum-treatment. It is a new method, full of promise, and leads us to the hope that, by the discovery of various antitoxins for the several varieties of septic infection, the pathology and treatment of puerperal fever may be extricated from the confusion of conflicting hypotheses and placed upon a solid, scientific foundation.

Concluding Remarks.—The numerous and dreadful lesions caused by septic infection, and their fatal consequences, constitute the strongest sort of appeal for intelligent and painstaking *prophylaxis*, which, while it may require time and care, will be as certainly effectual as anything within the range of medical science, and will amply reward the conscientious obstetrician for any time and trouble he may expend in the attempt to attain a rigid antiseptic *technique* in the practice of midwifery.

CHAPTER XXXV.

CENTRAL VENOUS THROMBOSIS—PERIPHERAL VENOUS THROMBOSIS—ARTERIAL THROMBOSIS.

Central Venous Thrombosis (Heart-clot).—Blood in the right ventricle of the heart coagulates, forming clot which plugs, and perhaps extends into the pulmonary artery, thus usually producing sudden death by asphyxia, in consequence of obstruction to entrance of blood-current into lungs. In some cases the coagulation *begins* in the heart primarily, in others an embolus, from a thrombus in some distant vein, *lodges in the heart*, and this becomes the nucleus around which further coagulation takes place.

Causes.—Conditions by which tendency to blood coagulation is increased, viz.: 1. *Hemorrhage*, either before, during, or after labor. Blood-loss is always followed by increase of fibrin in the blood retained. Increase of fibrin favors coagulation. 2. *Slowness or feebleness of blood current;* hence *syncope* (in which the heart is almost at rest)—whether from hemorrhage, or from exhaustion following a long labor, or from sudden reduction of intra-abdominal pressure after rapid delivery, or from previous debility—favors coagulation. Great feebleness of the circulation, *without* syncope, may produce it. 3. *Septic infection* of the blood and accumulation in it of effete matters resulting from involution of uterus, etc. 4. *Excess of fibrin*, common to blood of pregnant women. 5. *Thrombi in other veins* may give off fragments (emboli), which lodge in ventricle or pulmonary artery, and constitute nuclei for

growth of larger clots by accretion. Several of the above conditions may be combined in lying-in women.

Post-mortem Appearances.—Firm, leathery, laminated, and decolorized clots in right ventricle and pulmonary artery, and its larger branches. Coexistence of thrombi, sometimes, in other veins.

Symptoms.—Sudden occurrence of intense dyspnœa and cardiac pain, preceded, or not, by syncope. Extreme pallor, or lividity of face. Violent gasping and respiratory motions, which are short and hurried. Pulse thready, feeble, fluttering, or nearly imperceptible. Skin cool or cold. Intelligence may be unimpaired. Death may occur in a few minutes; or, if obstruction in pulmonary artery be not complete, the symptoms may ameliorate, but return, and repeatedly, when patient attempts the slightest movement. Some live *hours*, some *days;* a *very* few recover. Cardiac murmur may sometimes be heard over site of pulmonary artery.

Diagnosis.—Dyspnœa and asphyxia, with sudden death, may be produced by entrance of air into uterine vessels at placental site—the air having reached the vagina and uterus by use of imperfect syringes, or during manual and instrumental deliveries, or from placing the woman in the genu-pectoral or lateroprone position, or sudden removal of abdominal pressure after violent pains that have expelled liquor amnii may, if vulva gape, produce aspiration of air into vaginal canal. Gases may be produced *in utero*, from decomposition. Symptoms are nearly the same as heart-clot; so is treatment.

Sudden deaths from hemorrhage, shock, uterine rupture, and concealed bleeding from separation of a normally placed placenta, have already been mentioned.

Treatment of Heart-clot.—*Prevent* the accident, when, as after severe hemorrhage, etc., it may be anticipated, by keeping the *head low*, and enjoining *absolute* repose in *recumbent posture*, not permitting the woman to elevate her head *for any purpose whatever*. *Treat* the accident, when it has occurred, by bold administration of *stimulants*—whiskey, brandy, ammonia, etc. Whiskey ʒj, or sulphuric ether ʒj, may be repeatedly injected hypodermically. Fresh air. Milk and beef essence. Absolute and perfect rest. The slightest movement may be fatal. Apply warmth to the surface. Prolonged rest, after subsidence of violent symptoms, until blood be restored by iron, quinine, and food.

Peripheral Venous Thrombosis.—Clots of blood, forming in the peripheral veins, occur for the most part in the veins of the lower extremity or pelvis (notably in the crural, tibial, or peroneal); and thus, leading to obstruction, produce swelling of the limb; hence peripheral venous thrombosis is the new name for old-fashioned "milk-leg." (Synonyms: "White-leg," "phlegmasia dolens," "œdema lacteum," "crural phlebitis," etc.)

Causes and Pathology.—Conditions favoring blood coagulation (just mentioned as productive of *central* thrombosis) act as predisposing causes. The disease is apt to occur after placenta prævia, or after manual extraction of placenta. Coagula from placental site may float into hypogastric veins, and obstruct blood-flow through crural veins. Multiparity; feebleness and debility; difficult and complicated labors; inflammations about the pelvis, following obstetrical operations; hemorrhages; septic infection; cancerous and other pelvic tumors; occurrence of erysipelas, and of puerperal and other fevers during childbed, may be set down as causes.

The disease may occur after abortion (especially when some part of the placenta has been retained) and sometimes it begins independently of both abortion and labor.

Formation of blood-clots (thrombi) in the affected venous trunk is, at present, most generally admitted as the starting point of the *local* phenomena, though various other theories severally regard the venous obstruction as being secondary to phlebitis, cellulitis, lymphangitis, etc.; and, finally, these local inflammations have been traced back to *septic infection*, which, by most modern authorities, is now regarded as the real cause and origin of the disease.

Symptoms.—Usually begin within one, two, or three weeks after labor. Premonitory *malaise*, depressed spirits, weakness, and irritability of temper. *Pain* in the limb, perhaps first referred to the hip-joint, or inguinal region, and then extending to thigh and leg; or may begin in the ankle or calf of the leg, and extend upward. It is a dull, dragging pain, increased by motion. Chill followed by fever. Arrest of milk and lochial secretions; the lochia, if present, are offensive. Pulse may reach 120; temperature 101° or 102°, with evening exacerbation. Tongue coated. Bowels constipated. Restlessness; sleeplessness; thirst. Chill, fever, etc., may be absent in mild cases.

Within twenty-four hours limb begins to *swell;* swelling increases until skin is tense, white, and shining, from œdematous accumulation of effused serum in the cellular tissue. Complete *loss of power* in the leg, the patient being unable to turn it over in bed. Some *loss of sensation* in it, a "wooden" feeling. Its temperature increased. Affected vein, or veins, may be felt as thick hard cords, rolling under finger, red and tender. On the inside of the thigh the femoral sheath feels as large as a walking-stick; a red flush, and tenderness on pressure, mark its course. Glands of groin may be swollen, inflamed, and hard. Vulva also œdematous.

In a week or two both local and general symptoms abate. Swelling diminishes by absorption of effused serum, ending in recovery. Other cases terminate in suppuration and abscesses in the limb, pelvis, or lymphatic glands of groin. Rarely gangrene occurs. Floating fragments of thrombus may lodge in distant parts, producing metastatic abscesses in lungs, liver joints, etc., with pyæmia, septic infection, and death.

In cases of recovery, some swelling, impairment of motion, and liability to relapse, may continue for weeks or months.

Prognosis.—A fatal termination is exceptional. It is to be feared in pyæmic cases and in those attended with suppuration of the limb. *Complete* recovery, as regards the limb itself, may be long delayed, owing to partial or complete occlusion of venous trunk, and its conversion into a fibrous cord.

Treatment.—Perfect rest and slight elevation of the limb. Swathe it in flannel wet with hot water, and cover flannel with oiled silk, or apply hot flaxseed-meal poultice constantly, together with turpentine, laudanum, or belladonna, to relieve pain, as follows:

℞.—Lin. sapon. co. ℥vjss.
Tinct. opii, ℥jss.
Tinct. aconit. rad.
Extr. belladon. āā ℥ss.—M.

Rest and *moist warmth* are all-sufficient for acute stage. Instead of the wet flannel, or poultice, should these be inconvenient and disagreeable, swathe the limb in cotton batting covered with oiled silk.

Local treatment after subsidence of acute symptoms consists in application of dry flannel bandages in place of poultices.

Rest and elevation of limb to be continued until affected veins are entirely restored.

The "gentle frictions" formerly used to promote absorption had better be omitted entirely. *All* frictions are liable to dislodge a thrombus and cause it to float away to some more dangerous locality. The limb may be painted with tincture of iodine or ointment of iodine, or mercury may be applied to promote absorption, but without any friction whatever.

Formations of pus (sometimes deeply situated in the cellular tissue of the limb) require free incision under antiseptic precautions, aseptic cleansing, and drainage according to surgical rule.

During convalescence an elastic stocking, or elastic bandage, is extremely useful to prevent swelling of the limb when the patient begins to walk.

The general treatment is the same as for other manifestations of septic infection, viz., *alcoholic stimulants* and *liquid foods;* and, in cases occurring soon after labor, *antiseptic douches* to the genital canal must be used. In later cases—coming on three or four weeks after delivery—the douching may be unnecessary unless there be some indications for its employment, such as an offensive discharge.

Laxatives to relieve constipation, and anodynes (either Dover's powder or morphia), to relieve pain, during early stage; and, later, bitter tonics—tinct. ferri chloridi, quinine, and strychnia—will be necessary.

Alkalies, given with a view to dissolve thrombi, are uncertain and questionable; though recently *five-grain* doses of the potassic nitrate *every hour*, during acute stage, have been extravagantly extolled as producing convalescence in two or three days.(?) The patient should on no account leave her bed until the thrombus has entirely disappeared and the vein become restored. Should she do so, it would endanger sudden death, from thrombus plugging pulmonary artery after displacement.

The almost hopeless pyæmic cases will require the same treatment as already described under Uterine Phlebitis, page 507.

ARTERIAL THROMBOSIS AND EMBOLISM.—Very rarely, clots (thrombi) form in the *arteries* of puerperal women, in-

stead of, or as well as, in the veins. They may also result from the breaking up of a venous thrombus, the fragments of which pass through the heart, and go on in the arterial system until arrested by some artery too small to let them pass. Such arrested floating fragments of a thrombus are called "emboli." Arrested detached fragments of "vegetations" from cardiac valves, following rheumatic endocarditis, sometimes occur.

Symptoms depend chiefly upon the defect or arrest of function and nutrition of the particular organ or part whose artery has been obstructed by the clot. Paralysis and aphasia result from plugging of cerebral arteries, and blindness from obstruction in the ophthalmic. When the brachial or femoral arteries are the seat of thrombi, the respective limbs below the obstruction suffer a reduction of temperature, loss of motion and sensation, or, instead of this last, severe neuralgic pain. Pulsation in the artery is lost *below* the obstruction and strengthened *above* it. Gangrene may occur when the collateral circulation is inadequate to sustain nutrition of the limb.

Treatment.—Rest and good diet, with perhaps stimulants, and anodynes to relieve pain. In time the obstructing body will disintegrate or undergo absorption, but no treatment of which we are aware can hasten these processes. Gangrene belongs to surgery.

CHAPTER XXXVI.

INSANITY DURING GESTATION, LACTATION, AND THE PUERPERAL STATE, PUERPERAL TETANUS, ETC.

THE old term *puerperal mania*, inasmuch as it implies simple *mania*, and only during the puerperal period, is becoming obsolete. Viewed more comprehensively, mental derangements in the female having a causal relation with reproduction may be classified chronologically as follows:

1. Insanity of pregnancy.
2. Insanity of the puerperal state.
3. Insanity of lactation.

These, it is evident, may overlap each other, or occur successively in the same patient.

The insanity, at whichever period it occurs, presents one of two special, and to some extent opposite, phases, viz., *mania* and *melancholia*. Both are sometimes combined.

Mania is characterized by paroxysmal violence, mental fury, raving, etc. *Melancholia* means continued despondency, steady gloom, quiet depression, suspicion, mistrust, etc. The mental atmosphere in *melancholia* is steadily dark from impending clouds; in *mania* it is violently agitated, as from a cataclysmic storm.

Causes.—The three varieties of insanity have certain causes in common, viz., hereditary predisposition; primiparity after thirty years of age; pre-existence of insanity, epilepsy, hysteria, dipsomania, and other neuroses are predisposing causes. During *pregnancy*, constipation, indigestion, mental worry from accidental circumstances adding to the depression and despondency common to pregnant women, as, *e. g.*, seduction, desertion, etc., contribute to produce the disease. *Special* causes of insanity during the *puerperal* period are: difficult, painful, prolonged, and complicated labors; post-partal hemorrhage; eclamptic convulsions; exhaustion and debility, as from over-frequent childbearing, from lactation during pregnancy, or from previous disease. Violent mental emotion, as fright, shame, sorrow, etc. Septic infection and albuminuria, with uræmic contamination of the blood, are additional causes. The insanity of *lactation* is essentially a disease of debility and anæmia, these conditions arising from prolonged lactation, frequent childbearing, post-partal hemorrhage, or other causes of exhaustion. An ill-nourished brain cannot perform its normal functions.

Symptoms.—The insanity of *pregnancy* commonly begins about the third or fourth month, or from then to the seventh, rarely later. Symptoms follow the *melancholic* type, and are sometimes exaggerations of previously existing mental, moral, and emotional disturbances, usually noticed as *signs* of gestation. There are headache, insomnia, gloominess, or irritability of temper, personal dislikes, etc., with tendency to suicide. Cure before delivery is exceptional, and there is liability to mania during or after labor.

The insanity of the *puerperal period* is most frequently, but not always, of the *maniacal* type. In very painful labors, when the head is just passing the os uteri, or perineum, a *temporary* frenzy, or "delirium of agony," is sometimes suddenly

developed, but *soon passes away.* This is *not* the kind of mania now under consideration. Puerperal mania *proper* begins usually within two weeks after delivery. It may be a week or two later. Sometimes it comes on within a few hours, rarely in a few minutes, after labor. It may or may not be preceded by premonitory symptoms, such as restlessness, headache, insomnia, or sleep disturbed by painful dreams, manifestations of suspicion and dislike toward relatives and attendants, etc.; soon followed by incoherent talking, probably upon amatory, obscene, or religious topics. Patient steadily refuses to take food, and, as excitement increases, refuses to stay in bed, tears off her clothing, screams, prays, attempts self-mutilation or suicide, or to inflict injury upon others. In time, the paroxysm of mental excitement sobers down to melancholy, but fresh outbreaks are liable to occur on slight provocation. During excitement the pulse is accelerated and small. The digestive system is usually at fault, as shown by furred and coated tongue and constipated bowels. The urine is high-colored, and often passes involuntarily; there may also be involuntary stools.

When *mania* is absent, the *melancholia* symptoms are: persistent refusal to take food; insomnia; intense depression; religious or other delusions; weeping; praying; gloomy silence; tendency to suicide, infanticide, etc. Signs of digestive derangement.

The insanity of *lactation* is generally of the melancholic type, but may be associated with transient mania. It is much more common than insanity of pregnancy; less so than that of the puerperal period. It is usually attended with symptoms of *anæmia.* May degenerate into dementia and hopeless insanity.

Prognosis.—As to *life,* the *puerperal* form, usually favorable, but not always. Extreme frequency of pulse, elevation of temperature, and coexistence of pelvic or other inflammations are of grave significance. Mania is more dangerous to life than melancholia. The prognosis, as to restoration of reason, is less favorable in melancholia. In this respect, also, previous existence of insanity, or its coming on during lactation, or during latter half of pregnancy, are unfavorable, though not invariably so. Insanity coming on *early* in pregnancy, and constituting simply exaggeration of usual mental eccentricity of gestation, is less serious.

Sometimes weeks or months pass before a cure is effected.

There are no special post-mortem appearances other than those of anæmia or coexisting inflammations.

Treatment.—The transient frenzy of acute suffering during delivery is relieved by anæsthesia.

True insanity, at whichever of the three periods it occurs, and whether of the maniacal or melancholic type, requires remedies addressed to *general condition* of patient rather than to mental symptoms. No depletion is called for; but, on the contrary, *food*, *rest*, *sleep*, and *strengthening medicines*.

At the outset give a *laxative*, mild or stronger, according to strength of patient and previous constipation, but always with caution as to reduction of strength by excessive purging. After its operation, secure sleep by bromide of potassium (ʒss every eight hours); or, if this be inefficient, give, with each dose, hydrate of chloral gr. xx. Thirty grains of chloral with sixty of the bromide may be given by enema, if patient refuse to swallow. Opium and morphia are, on the whole, objectionable—certainly so in mania cases; the latter may be given hypodermically in melancholia. In mania cases, paraldehyde in doses of one or two fluid drachms largely diluted, and hyoscyamine, in doses of gr. $\frac{1}{100}$ to $\frac{1}{80}$, have been given with advantage to produce sleep.

Feed the patient with solid meats, if she will take them. If not, give beef-tea and as much *milk* as possible. The latter will sometimes be accepted as a drink, when the patient declines to *eat*, especially when brought in an earthen instead of a glass vessel, and in a darkened room. Cold to the head, warm pediluvia, a bath of 90° F., or the hot, wet pack for refractory patients, assist in promoting sleep.

Good nursing is of great importance. Every patient should be constantly watched—to prevent self-injury—but without her being aware of it, if possible Strangers are more acceptable to most patients than husbands, relatives, and friends. The bladder and rectum require special care to secure their being regularly evacuated at proper intervals. Beware of bedsores. Great tact necessary, by firm yet gentle persuasion, to induce the woman to take food. Its artificial administration by force, seldom advisable, though sometimes necessary. The room should be quiet and dark. The woman must not nurse her child.

Insanity coming on during lactation *always* requires imme-

diate weaning of the child, and in addition to food, sleep, etc., iron and quinine are necessary to restore the blood.

The propriety of sending patient to asylum depends much on facilities for good nursing at home. When the latter are wanting, an asylum is demanded. Mania, being of shorter duration than melancholia, and less likely to be followed by confirmed dementia, may be managed at home in most instances. In chronic melancholia, sending the patient to an asylum should not be unduly postponed.

During convalescence, avoid all sources of mental excitement. Continue careful feeding, sleeping medicines at night, laxatives, and tonics until strength is fully restored, when change of scene and cheerful surroundings complete the cure.

PUERPERAL TETANUS.—Resembles ordinary surgical tetanus. Very rare in temperate climates, less so in tropical ones. It occurs after full-term labor, but more frequently after abortion.

Causes and *pathology* probably the same as in surgical tetanus. The greater number of recorded cases have followed *instrumental* abortion or *operative measures* to empty the uterus in abortion cases. It is probably due to infection from introduction of a specific microbe at the site of some traumatic lesion, whether the latter be from operative proceedings—surgical or obstetrical—or lacerations incident to labor. Exposure to cold and damp, or to draughts of cold air, is an especial exciting cause.

Symptoms.—Pain and stiffness in muscles of neck and jaw; nervousness and agitation; rise of temperature. The muscular stiffness increases, soon leading to lockjaw, and later to general attacks of painful spasm, opisthotonus, etc. The general spasms are easily provoked by slight shocks, noises, or jars about the room and bed, or by attempts to take food. Swallowing soon becomes impossible; hence nutrition fails, and in a few days, varying from one to three or four, the patient dies from exhaustion and interference with respiration. Some die in a few hours; about 10 per cent. recover.

Treatment.—Antiseptic irrigation of uterus and vagina. Internally: chloral, opium, the bromides, Calabar bean, cannabis Indica, and curara, as in ordinary surgical tetanus. Anæsthesia affords only temporary relief from spasm and suffering. Nutrient enemata and inunction of the skin

can be tried to support the patient when deglutition is impossible. Tetanus antitoxin is deserving of trial.

Tetany (Tetanoid Contraction).—This is a derangement occurring in nursing women, or during pregnancy, in which there is painful cramp or spasmodic contraction in one or more *fingers* or *toes*, beginning here and advancing up the limbs, in severe cases, to the neck and trunk. The contractions are intermittent, and differ from tetanus in beginning in the extremities instead of in the neck and jaws. The contractions are sometimes painful, at others they begin with tingling sensations, and again there may be anæsthesia of the affected parts. It is rare. Sometimes they may be simply hysterical. Among the *causes* are: blood loss, prolonged lactation, diarrhœa, this last suggesting that the cramps are identical with those of cholera or choleraic diarrhœa. Most cases recover. It is *treated* by antispasmodics, opium, chloral, valerian, bromides, etc., and by arresting the diarrhœa, overlactation, or whatever condition may exist as a cause of exhaustion.

CHAPTER XXXVII.

INFLAMMATION AND ABSCESS OF THE BREAST—LACTATION AND WEANING.

Inflammation of the Breasts (Mammitis; Mastitis).—Inflammation may attack the *substance of the mammary gland* itself ("glandular mastitis"), or the layer of cellular connective tissue lying underneath the gland, between it and the pectoralis major muscle ("subglandular mastitis," or, more properly, submammary cellulitis). A more circumscribed form of inflammation occurs in the subcutaneous tissue immediately beneath the areola of the nipple (subcutaneous mastitis).

Either variety of inflammation *may* terminate in resolution without suppuration taking place; but in every case an opposite termination is to be feared, viz., the formation of pus, and consequent "mammary abscess" ("gathered breast").

In "*glandular mastitis*" the inflammation and suppuration (when the latter occurs) are usually confined to one lobe, or to two contiguous lobes of the gland, but, when the abscess has discharged its contents, the inflammatory and suppurative processes may go on to the next adjoining lobe, and so on to another and another, until a greater part of the gland is destroyed by the succession of abscesses, the woman becoming meanwhile seriously, or even dangerously, debilitated by continued suffering and exhausting purulent discharges.

In *submammary cellulitis* inflammation is more diffuse—not confined to the vicinity of any particular lobe of the gland; and, when pus forms, it is apt to infiltrate itself between the gland and chest-wall, separating the one from the other, or leading to long, sinuous tracts, which eventually form fistulous openings, through which matter is discharged. In neglected cases the fistulous orifices may enlarge by sloughing of their borders into ulcerated surfaces of considerable size. In one such case I was able, by lifting the gland away from the chest-wall, to look in at one fistulous ulcer and see daylight admitted through others on the opposite side.

This form of inflammation may begin *de novo*, as a cellulitis, or the latter may be associated with or produced by inflammation of the gland itself, the glandular abscess, when deep-seated, discharging its pus posteriorly into the cellular tissue lying beneath the gland. It is not of frequent occurrence.

The "*subcutaneous*" form of mastitis usually terminates in suppuration, forming small abscesses, or boils, in the vicinity of the areola, their opening sometimes forming fistulous communication with the milk-ducts.

Causes of Mammary Inflammation.—The most common cause is probably *septic infection* of the breasts (through erosions and fissures of the nipple, or through the external orifices of milk-ducts), and rapid propagation of microbes in *accumulated engorgements of stagnant milk* within the ducts and acini of the glands. Micrococci of various kinds (the staphylococcus pyogenes aureus, staphylococcus pyogenes albus, the diplococcus, the streptococcus, and various forms of bacteria) have been found in the *milk* and in the *pus* of inflamed breasts. If the nipples were always kept absolutely aseptic, and no stasis of accumulated milk was ever allowed to take place (a thing much more easily said than done in private practice), inflam-

mation and abscess of the breast would probably never occur, except in rare cases of *traumatic injury.*

Women who have once suffered from mammary abscess are liable to do so again at succeeding lactations, probably because cicatricial adhesions and contractions have produced obstruction in some of the lactiferous ducts. Those who do not attempt to nurse at all are peculiarly exempt from mammary inflammation; while in those who begin to nurse and then stop, the affection is most apt to occur.

Symptoms.—Inflammation of the breast, of either variety, may or not be preceded by excoriation or fissures of the nipple. So, too, a lump may form in some part of the gland from accumulation of milk, and be attended with some slight tenderness on pressure, but yet be dissipated, under proper treatment, without inflammation taking place. Such an indurated nodule, however, is never safe from superadded inflammation upon very slight provocation. When the inflammatory process really begins, the symptoms are: Chill, fever, rise of temperature, hot skin, frequent pulse, headache, thirst, anorexia, etc.

Locally, lancinating pain in the breast, increased by pressure; increased hardness, heat, swelling, and, at first, very slight redness.

Should the case terminate in resolution, the symptoms gradually disappear in a few days. When it goes on to suppuration, both local and general symptoms increase in severity. There are constant throbbing pain, increased tenderness and swelling, decided redness and heat of skin over the inflamed part, which also appears glazed, shining, and œdematous. The hard lump has now become soft and fluctuating; the latter, however, by no means distinct at first, or when the abscess is small or deep-seated. The fever is continuous, but liable to exacerbations following slight rigors, occurring several times a day. If left alone, the pus eventually makes its way to the surface, the abscess bursts, and is discharged, greatly relieving the pain and tension; and either recovery soon follows, or subsequent renewed attacks develop later, as before described.

Inflammation *without* abscess occurs most often within the first week after delivery. Inflammation *with* abscess is more frequently a later occurrence, coming on in three or four weeks after labor, or, again, the acute symptoms of inflammation

may apparently disappear, leaving only a feeling of weight, with some pain and tenderness, and yet suppuration may occur, even after several months.

The symptoms now described occur, varying in degree with the extent of inflammation, in each variety of mammitis. When, however, the subglandular cellular tissue is inflamed, a few of the symptoms are considerably modified; thus, the whole breast is swollen and tender, instead of there being one special point of tenderness, and every motion of the arm produces pain, owing to movement of the chest muscles underneath the gland. The pus is slow in coming to the surface; may accumulate in large quantities before doing so, and lead to severe constitutional disturbance and numerous fistulæ and sloughing ulcerations.

In protracted cases of either form of inflammation, accompanied with profuse and prolonged purulent discharge, symptoms of prolonged exhaustion and debility may ensue.

Mammary abscess usually affects one breast only, though sometimes both. The secreting function of the diseased gland, though not at first necessarily arrested (for the healthy lobules continue their secretion), is eventually lost from the necessity of withholding the child from suckling the inflamed breast. When, however, the inflammation has been only slight, and the abscess small, lactation may often be resumed after convalescence.

Treatment.—In the very beginning, try to get rid of inflammation without suppuration taking place. In each variety of the disease enjoin rest in bed, with rest of the inflamed organ, by not allowing the child to suckle from it. Keep down the secretion of milk by saline cathartics and abstinence from fluids. Apply over the entire breast extract of belladonna ʒj, mixed with linimentum camphoræ ℥j, or, instead of this, the lead and opium wash (℞.—Plumbi acet. ʒij, extr. opii grs. xvi, aquæ Oj) may be constantly applied on patent lint covered with oiled silk.

Painting the breast with tincture of iodine once during the first twenty-four hours is an excellent abortive measure. Conjoined with these medicinal applications, cover the inflamed organ with a bandage, cushioned inside with cotton wool, so as to make even and sytematic *compression*. Add one thing more, viz., *dry cold*, by keeping constantly over the inflamed breast a bladder, or thin rubber bag, filled with cracked ice.

Fissures or erosions about the nipple should be made antiseptically clean and then painted with a nitrate of silver solution (grs. xx to water ℥j) before the other applications are put on. Instead of ice applications, *hot* ones (flaxseed-meal poultices) are used. Resolution may occur with either plan. The *cold* applications are better during early stage of inflammation, and may be changed for *hot* ones when suppuration seems inevitable, to hasten that process and bring the pus toward the surface. Internally the woman will require opiates to relieve pain, quinia to control temperature, and a diaphoretic mixture (R.—Liq. ammon. acet. ℥ss, with spts. æth. nit. ℥ss, every two hours) to promote elimination of fluid from the skin.

In cases where accumulation of milk in the inflamed breast is *very* great, and not relieved by the remedies given, it may be necessary to mitigate the tension by gentle expression with the hand, previously anointed with camphorated oil; but, on the whole, breast-pumps, suckling, and manipulation are not generally advisable, on account of the irritation they produce. The child may generally be allowed to suckle from the healthy breast, but when the mother is much reduced in strength, or when suckling the one appears to keep up engorgement in the other inflamed side, the child should be weaned altogether, with a possibility of lactation being resumed after recovery.

When symptoms of suppuration begin, the local treatment consists in applying hot poultices of flaxseed meal until fluctuation can be detected, when the abscess must be opened without delay. In subglandular cellulitis the point of opening must be at the lower margin of the base of the gland, the line of incision following the circumference of the gland. An aspirating needle may be required to detect pus accumulation *early* in these cases, before the incision is made.

In other cases, incise over the most soft and prominent portion of the abscess, the incision radiating from the nipple, so as to avoid cross-cutting of the milk ducts. The breast should be first cleansed and anointed with carbolized oil, and, after the incision, treated with antiseptic gauze, drainage-tube, oiled silk, and a wide bandage, cushioned inside with oakum, so as to make uniform moderate pressure upon the inflamed organ. A strip of carbolized lint or drainage-tube must be kept in the opening to prevent union for a few days, or until the discharge has become insignificant in quantity. Long sinuous tracts and fistulæ may require antiseptic injections and

drainage, or their walls may be stimulated to healthy granulation by an occasional injection of nitrate of silver or sulphate of copper, as in ordinary surgical wounds.

In old neglected cases, timidly treated by small incisions, the patient should be anæsthetized with sulphuric ether, the incision enlarged enough to admit a finger, which may then be passed in to break up the dividing partitions of the several abscesses and convert them into one large cavity, which should be at once irrigated with a 2 per cent. creolin solution, and then treated with drainage-tube and antiseptic dressing.

When acute symptoms have subsided, leaving the breast stiff, red, and unevenly indurated, with weeping fistulæ, paint with *tincture of iodine* and apply systematic *compression* with adhesive plasters, leaving small apertures opposite the fistulæ.

In every case of considerable duration, good food, iron, quinine, and bitter tonics will be necessary to prevent debility and exhaustion.

The treatment of mammary *inflammation* with a view to *prevent suppuration* has always been unsettled, embracing many different and sometimes opposite methods. The main principles are: 1, *rest, i. e.*, keeping the child from the inflamed breast; 2, systematic compression by well-padded bandages; 3, application of ice or of astringent and anodyne lotions; 4, reduction of milk by laxatives; 5, fever, pain, and other symptoms to be treated as they arise; 6, cure of sore nipples and *thorough antiseptic cleanliness.*

Finally, the employment of fld. ext. *phytolacca decandra* (poke root) in doses of 20 drops every three or four hours, and applied to the inflamed breast locally, has been extolled as a specific; it is said to cure in twenty-four hours. (?)

Lactation and Weaning.—No arbitrary rule can be laid down suitable for all cases, as to the length of time a woman should nurse her child. About one year is the average time at which weaning may take place. Many mothers nurse their children longer. With savages lactation is often continued several years, or until the advent of another child. With many delicate and sensitive women in the higher walks of life it is impossible to continue lactation beyond a few months, and many of those who persist in prolonged lactation beyond a year, suffer in consequence from anæmia, menorrhagia, and

permanent impairment of their capacity for lactation, as is demonstrated when future children are born to them.

Besides a general incapacity for producing milk without exhaustion, there are certain conditions which should prohibit a mother from nursing her child. These are: a strong hereditary tendency to cancer, scrofula, and insanity, constitutional syphilis, great emotional excitability. A violent fit of anger has rendered the lacteal secretion sufficiently poisonous to produce convulsions in the child. Lesser, but more constant, degrees of emotional excitement produce deterioration of the milk to an extent which may still be injurious.

The return of menstruation and the recurrence of pregnancy during lactation usually change the milk and make it unfit for the child. Exceptionally this is not the case. Some pregnant and menstruating women continue to secrete milk that agrees with the child. The health of the infant will indicate to which class the mother belongs.

When from any reason the woman is not able to nurse, the infant must either be fed by hand or supplied with a wet-nurse, the latter course being always preferable when it is practicable. In selecting a wet-nurse it should be ascertained that she is free from all of the impediments to lactation just referred to; that her digestion and appetite are good; that her disposition is cheerful and good-natured; that she is free from eruptions on the skin; has sound gums and teeth and inoffensive breath; and that her own child is healthy and well nourished. Her breasts and nipples must be normal, and it should be known that fulness of the breasts has not been artificially contrived by permitting milk to accumulate for many hours before the examination. The age of the wet-nurse, where there is room for choice in this particular, should be between twenty and twenty-eight years, and the time of her confinement as nearly as possible coincident with that of the mother whose child she is to nourish. When no wet-nurse can be procured, the child must be artificially fed by hand. Directions for the preparation of its food have been previously given in Chapter XIII. (page 228).

CHAPTER XXXVIII.

RESUSCITATION OF ASPHYXIATED CHILDREN.

CHILDREN born *dead* are said to be "*still-born.*" Others are born in a state of suspended animation—apparently dead, not really so; there is no breathing, but the heart still beats. It is asphyxia just within a fatal degree; technically *Asphyxia neonatorum*—the asphyxia of newborn children.

Causes.—First. Conditions of *mother* interfering with respiratory functions of placenta, viz., death of the mother; extensive pulmonary disease, restricting her own respiration; profuse hemorrhage or profound anæmia from other causes, which may leave her without sufficient red globules to carry on respiration, etc.

Second. Conditions of *child* and its *appendages*, viz., compression and twisting of umbilical cord; interference with placental circulation by its partial or complete separation before birth, as in placenta prævia, etc.; prematurity of birth; injury of child's head during delivery by compression of forceps, narrow pelvis, etc., possibly with intercranial hemorrhage, shock, and nervous disturbance, preventing action of inspiratory muscles after birth.

Symptoms.—Before delivery asphyxia should be anticipated when the above causes are known to have been present. Fœtal heart (by auscultation) found at *first* to beat with *diminished* frequency, not only during, but *between*, the pains: later on there is *increased* frequency of the heart-beats. *Discharge of meconium* is of great diagnostic import when *not* accounted for by compression of child's abdomen, as in breech presentations.

Discharge of meconium also indicates that breathing *in utero* has occurred, which makes the case worse from fluids having been drawn into air-passages. Occasionally air gets into womb, and child is heard to cry before birth (*vagitus uterinus*). When child's body is partly extruded inspiratory efforts may be *seen*, as may also the lividity, etc., indicating asphyxia.

Symptoms *after* birth: The child is born in one of two con-

ditions: it is either *livid* in color, with purple, dusky-red, and congested skin, dark and swollen lips, etc., constituting the earlier and milder form of asphyxia called *Asphyxia livida*, or it is *pale*—of a corpse-like whiteness—with anæmia of the skin, constituting the later and more fatal form of asphyxia called *Asphyxia pallida*.

In the *livid* variety the vessels of the cord are full and turgid; in the *pale* variety they are empty, or nearly so. In *livid* cases the limbs and muscles retain some tonicity, and reflex contractions may be excited by pinching and other stimuli; in *pale* cases muscles are totally relaxed, including the sphincters, and reflex excitability is absent; the lower jaw drops, the head dangles loosely. Pupils are widely dilated.

Prognosis.—Most of the *livid* cases may be resuscitated; so may some of the *pallid* ones. While the heart beats, there is hope; it *may* beat when not felt to do so, and when all pulsation in the cord has gone. Exceptional cases have *undoubtedly* been resuscitated seven or eight hours after delivery; most of these die, after a few days, from pulmonary extravasation, atelectasis, and pneumonia, but recoveries are known. Any child that is fresh—*i. e.*, not macerated, or presenting evidence of having been dead some considerable time—should be subjected to treatment; it satisfies the parents.

Treatment.—In any case, whether *livid* or *pallid*, waste no time in making a diagnosis between life or death. Act as if the child were *alive*, but never hurry; it is not a matter of moments, but may require a *full hour* before abandonment would be justifiable, even though the child may not have breathed during this time.

In *all* cases there are *two* things to do, viz.:

1. *Remove foreign matters from the air-passages.*
2. *Get air into the lungs.*

In the bad, pallid cases, it may be necessary *after* removing foreign matter and *before* air can be introduced, to

3. *Open the glottis.* (The muscles, whose duty it is to open the glottis, fail to act: they participate in the general flaccidity of the muscles of the whole body, already noted.)

The methods of accomplishing these several objects are various.

1. Methods of Removing Foreign Matters from the Air-passages.—*a*) Place the child on its back, the head a

little lower than the body, hanging over the edge of a table. Pass the little finger into the fauces and so wipe out *the mouth* with a thin soft handkerchief.

(*b*) To clear out *the trachea*, place the child in same position, grasp the chest gently and continuously with one hand, and with a finger of the other stroke the trachea on the outside, from below upward, by which mucus is squeezed out of it into posterior nares. Let the finger now maintain pressure at the top of the trachea, and the other hand maintain its compression of the thorax, while the obstetrician blows gently into the child's mouth, previously covered with a handkerchief. Mucus from the trachea is thus forced out at child's nostrils.

(*c*) Pass a catheter into the trachea and aspirate or blow out mucus by application of operator's mouth to other end of it: or retain catheter in trachea while Schultze's method (mentioned further on) of artificial respiration is performed. To catheterize the trachea, select a gum-elastic male catheter, the diameter of the external circumference of which shall be less than one-eighth of an inch; fasten to it a string or tape, three and a half inches from the end to be introduced; guide its point with the finger behind the epiglottis and into the glottis, passing it in until the tape, three and a half inches from the end, touches the child's lips, when the point will remain above the bifurcation of the trachea. To retain catheter at this point, tie ends of tape around the back of the child's neck. Now compress thorax gently with one hand as before explained, and blow through catheter. Since the air blown in cannot enter lung, while thorax is compressed, it will rush back and up alongside of catheter and *carry mucus, etc., out of trachea* into pharynx. Suction of a catheter is a more unpleasant method, but not a better one.

2. Methods of Getting Air into the Lungs.—(*a*) The ordinary ways of exciting *natural inspiration* by sprinkling face, neck, and chest with cold water; rubbing the back of chest with brandy or whiskey on a bit of flannel; flagellate nates; dip the child first in hot, then in cold water; pull the navel-string downward by gentle jerks; eject a mouthful of cold water forcibly against the epigastrium.

(*b*) *Schultze's Method of Artificial Respiration.*—The cord must be cut and tied. The operator stands with his legs apart, his body leaning a little forward, and holds the child at arm's

length, hanging perpendicularly, in the following manner: He faces the child's back, puts an index finger into each axilla, his thumbs over the shoulders so that their ends lap over the

FIG. 222



Position of inspiration. (WITKOWSKI.)

FIG. 223.



Position of expiration. (WITKOWSKI.)

clavicles on to the front of the chest, the rest of his fingers go obliquely over the back of the chest, the ulnar sides of the two

hands support the child's head. The whole weight of the child's body now *hangs on the index fingers* in the axillæ (none of it should be supported by the rest of the hand), which lifts the ribs, expands the chest, and produces *inspiration* mechanically. (See Fig. 222, page 532.)

Inspiration having been thus accomplished, the second object of the operator is to produce mechanical *expiration*. This he does by swinging the child forward, somewhat powerfully, and at arm's length, until his arms are a little above a horizontal line, when, by a somewhat abrupt but carefully adjusted arrest of the motion, the thorax of the child becomes stationary, while the lower limbs and pelvis of the infant retain just enough of the swinging impetus to topple over toward the operator and in front of the child's abdomen (see Fig. 223, page 532). The bulk of the weight of the child now rests upon the thumbs in front of the thorax, while the abdominal viscera press against the diaphragm, etc., and produce *expiration*. At this stage of the manœuvre any fluids that may have entered the trachea are copiously discharged.

Finally, the operator again lowers his arms, letting them retrace the curve followed during their elevation, by which the legs and pelvis of the infant unfold from their doubled position, and falling down at full length the body is completely extended with considerable impetus, so that the child again hangs by the axillæ on the index fingers of the operator, just as it was before the swinging motion began. The whole process of each complete act, comprising both the *inspiratory* and *expiratory* movements, should occupy about seven seconds; hence it may be repeated at the rate of eight or nine times a minute, *somewhat* as follows:

	Seconds.
Inspiratory pause, while body supported by fingers in axillæ	2½
Upward swing	1
Expiratory pause, while thorax is supported on thumbs, and legs, etc., topple over . . .	2½
Downward swing	1
Duration of one complete act	7

This chronological division of each act may vary. When inspired fluids flow out while the child is elevated, a longer pause in that position is advisable. Schultze's method may

be used with or without catheter. Even without the catheter, and in the pallid cases with a closed glottis, it serves in some way to *open the glottis*, which other methods do not. Experiments on fœtal *cadavers* have proven that it secures the entrance of air into lungs, even of them.

(*c*) *Sylvester's Method of Artificial Respiration.*—Place child on its back, the shoulders resting on a little roll or cushion, just high enough to keep the chin from falling on the chest. Secure the feet to some fixed point. Stand behind the head; seize the arms (one in each hand) just above the elbows, and raise them gently and steadily upward and forward until they are fully extended along the sides of the child's head, at the same time rotate the humerus slightly outward; maintain the arms thus on the stretch for two or three seconds. This secures *inspiration*. Next, turn down the child's arms and press them firmly and gently against the sides of the chest for two or three seconds. This secures *expiration*. It may be necessary to pull the tongue forward to open epiglottis, and this does not always succeed. Should there be difficulty in securing patency of the glottis, the only *sure* remedy is the catheter, used as before stated.

(*d*) *Laborde's Method by Tongue Traction.*—An assistant holds the child in a half-sitting position, while the operator seizes the infant's tongue with the thumb and index finger and a piece of linen, as near to the base as possible, and pulls it forcibly forward and then relaxes it, repeating the tractions about fifteen times a minute. Instead of the fingers a pair of dressing-forceps may be used. It is supposed to excite respiration by reflex action. This method is new, and still a matter of experiment. It can do no harm. Evidence of its value is increasing. It would seem to be especially applicable to premature children in which the thoracic walls are too soft and yielding for the Schultze and Sylvester methods, and in which inflation of the lungs through a catheter is commonly necessary.

(*e*) *Method of Drs. Byrd and Dew.*—Let the child rest on its back, in the hands, so that the back of its neck lies between the thumb and index finger of the left hand, while the other fingers of this hand go into the child's left axilla. Be sure that the head *dangles freely backward* and downward over the junction between the thumb and index finger, otherwise the glottis may not open. The right hand holds the child's

thighs so that they rest in its palm, with the right index finger between them. Now the child's spine is alternately *extended* and *flexed*, which produces respectively *inspiration* and *expiration*. During *flexion* the knees and chin approach each other; during *extension* they are separated as far as possible. The body is thus folded and unfolded; doubled forward (knees and chin together), spine flexed; then stretched out backward as if it were suspended transversely on a trapeze, with the head and chest hanging on one side, and the pelvis and legs upon the other, so that the spine is extended, the chest expanded, and air consequently inspired. This manipulation is repeated fifteen times a minute. There are several other methods of holding and folding the child in the practice of this Byrd-Dew method, equally effective and easy of execution. One advantage of this method is that it can be done while the child is in a basin of (hot or cold) water.

When asphyxia is recognized *before delivery*, labor must be expedited by every available judicious means.

Schultze's method, while a rough proceeding, and requiring some skill, is *necessary*, at *first*, for the *pallid* cases, but may be followed by *Sylvester's* when the pallid stage is passed. For most *livid* cases the easier and gentler method of Sylvester may suffice.

In cases where the heart scarcely beats, its contractions may be stimulated by making slight pressure with the fingers over the præcordial region, or by injecting hot water (105°–108° F.) into the rectum; or by a few drops of brandy or whiskey injected hypodermatically.

Some cases recover by *rest*, after being "laid out" for burial, and when all methods of artificial resuscitation have been tried in vain.

CHAPTER XXXIX.

THE JURISPRUDENCE OF MIDWIFERY.

An obstetrician, even when not an acknowledged expert in medico-legal matters, may, from his professional relations with patients or persons implicated in legal trials, be compelled, on the witness stand, to give evidence of a scientific or *quasi-*

expert character. Under such circumstances a painful lack of scientific knowledge, often sufficient to defeat the ends of justice, and coupled with corresponding embarrassment on the part of the physician, is not infrequently exhibited in our courts. Hence I have ventured to add, in so far as may comport with the brevity of this work, a few rudimentary remarks upon medico-legal topics of an obstetrical character, which, while treating the subject only superficially, may, perhaps, afford some assistance to the unavowed expert, or confessed *un*-expert medical witness. The works on *Medical Jurisprudence*, by Dr. Alfred Swaine Taylor, and by the Drs. Beck, are my principal sources of information for what is to follow.

Duration and Unusual Prolongation of Pregnancy.—The average duration of pregnancy is *ten* lunar months (forty weeks—280 days). The moral character of a woman, and the legitimacy and consequent hereditary rights of offspring, may depend upon the acknowledged degree to which it is *possible* this normal duration may be prolonged, as when a woman gives birth to a child eleven or twelve months after the death (or continued absence from other cause) of her husband. It is undoubtedly *possible* for pregnancy to be prolonged four, five, six, seven, or even eight weeks beyond the normal period, and the child be born alive.[1] Cases are recorded in Taylor's *Medical Jurisprudence*, 5th Amer. ed., pp. 473–481; Playfair's *Midwifery*, 2d Amer. ed., pp. 154, 155; Lusk's *Midwifery*, 1st ed., pp. 109, 110; Leishman's *Midwifery*, 2d Amer. ed., pp. 178–181; Meigs's *Treatise on Obstetrics*, 3d ed., pp. 228–234; Beck's *Jurisprudence*, 11th ed., vol. i. pp. 600–604.

Those who assert such cases to be fabulous and unreliable may be answered with the statement that the same amount of prolongation has been observed in animals (cows and mares) in which the date of coitus was *positively known*.

The possible unlimited retention of the child in certain cases of extra-uterine gestation must be remembered in relation with the duration of pregnancy, in so far as it may affect the character of the woman. The child, after full term in such cases, always dies.

[1] A child may die near full term (after symptoms of labor have begun and disappeared), and remain *in utero* months and years afterward—so-called "missed labor cases."

Children born after overlong pregnancies may be overlarge, but are not always so.

THE AGE OF MATERNITY.—Social laws, in most places, restrict very early maternity, but in Oriental countries, where marriage is permitted earlier, girls become mothers at ten or twelve years of age. Such cases occur, rarely, in other climates. Three cases: one at eleven years, one at twelve, and one at thirteen, well authenticated, are recorded in Barnes's *System of Obstetric Medicine and Surgery* (1st Amer. ed., p. 241), in Great Britain. In one case the girl began to menstruate while a child twelve months old, and also had enlarged breasts, with growth of hair upon the pubes and in the axillæ. She was delivered of a child weighing seven pounds before she was ten years old. (London *Lancet*, 1881.)

As to the *latest* age at which a woman may bear a child, a few cases have been recorded at the age of fifty-one and fifty-two years (by Dr. Fordyce Barker, in Philadelphia *Medical Times*, 1874), and one at the age of fifty-five years by Dr. Davies, of Hertford, England (London *Medical Gazette*, vol. xxxix.). Dr. Barker declares that "the laws of physiology, the experience of mankind, and the decisions of courts of law, justify a medical man in declaring that a woman *over fifty-five years* of age is past the period of childbearing."

Though it is rare for women to bear children after the cessation of the menses at the "change of life," it is *possible* for them to do so, as rare cases occasionally demonstrate.

SHORT PREGNANCIES WITH LIVING CHILDREN.—A living child, and one that continues to live, being born nine, eight, seven, six, or five lunar months after marriage, may be the cause of suspected pre-marital inchastity on the part of the mother, and possibly of alleged ground of divorce by the husband, together with other legal and social complications. The child is undoubtedly viable at the end of the seventh lunar month. Exceptionally, children born at the sixth month have lived and been *reared*. Cases are even recorded where the infant survived a *short time* when born at the fifth, or even at the fourth month. (See Playfair's *Midwifery*, 2d Amer. ed., p. 229; Beck's *Medical Jurisprudence*, 11th ed., vol. i. pp. 599, 600, also p. 388; Meadows' *Manual of Midwifery*, 4th Amer. ed., pp. 93, 94; Taylor's *Medical Jurispru-*

dence, 5th Amer. ed., pp. 468–471.) The *possibility* of exceptional cases must always be remembered and stated. It should, moreover, be borne in mind that an error of a month may occur, depending upon the selected method of dating the *beginning* of the pregnancy—*i. e.*, whether from the last menstruation, or from the first *omitted* menstruation (see page 73).

Appearances of Fœtus at Different Periods of Gestation.—A medical witness may be asked to express an opinion as to the *probable* duration of a given pregnancy, from the appearance of the child. He cannot be *positive* or exact.

During first month.[1]—*Fœtus* a semi-transparent, grayish, gelatinous mass, about *one-twelfth of an inch* in length, with no definite, structure, head, or extremities. Pedicle of umbilical vesicle can be traced into unclosed abdominal cavity. Toward end of first month appearances more nearly resemble those of—

Second month.—Fœtus, at *commencement* of second month, about *half an inch* in length. Body weighs about 60 grains, is curved on itself; convex behind, concave in front. Head just distinguishable. No extremities. Eyes represented by two dark dots, the mouth by a cleft. Chorion formed and covered *on all parts* with villi.

Toward *end* of second month. Body *one*, or *one and a half* inches long. Head and extremities distinctly visible. Upper extremities appear first. Umbilical cord distinct, but untwisted (straight), and inserted into lower part of abdomen. Chorion distinct from amnion. Formation of placenta beginning.

Third month.—Body grows to length of 2, 2½, and by end of month to 3 or even 3½ inches. Fingers and toes formed, but are webbed. Head large compared with body. Nose, ears, anus, and mouth formed—the two last-named being closed. Eyes prominent; lids joined together. Pupillary membrane visible. Umbilical vesicle and allantois have disappeared. Chorial villi atrophied. Placenta separate and distinctly formed. Genitals visible.

[1] The text here refers to *calendar* months. I find no records of appearances at different *lunar* months.

Fourth month.—Body grows from 3½ to 5½ or 6 inches in length by end of month. Weight 3 to 5 or 6 ounces. Sex distinguishable. Mouth and anus open. Nails begin to appear. Chorion and amnion in contact with each other.

Fifth month.—Body grows from 5½ or 6 to 9 or 10 inches in length by end of month.[1] Weight increases from 6 to 10 ounces. Head one-third the length of whole fœtus. Hair and nails visible.

Sixth month.—Length 11 or 12 inches. Weight one pound. Hair distinct; also eyelashes. Eyelids still agglutinated, and pupils still closed by pupillary membrane. Clitoris prominent. Testicles still in abdomen.

Seventh month.—Length about 14 inches. Weight 3 or 4 pounds. Eyelids open. Pupillary membranes disappearing. Sebaceous matter on skin. Nails distinctly formed. Testicles descending, or descended, into scrotum.

Eighth month.—Length about 16 inches. Weight 4 or 5 pounds. Pupillary membranes gone. Nails reach to ends of fingers. Testicles in scrotum. Sebaceous matter on skin more plentiful.

Ninth month.—Length 18 or 20 inches. Average weight 6 to 8 pounds. Males usually larger than females. Nails horny, and reach beyond finger-ends; those of toes not so long. Meconium in rectum. Hair more or less abundant. Umbilicus placed midway between head and feet; but to this there are numerous exceptions.[2]

CASES IN WHICH A WOMAN MAY BE UNJUSTLY SUSPECTED OF CONJUGAL INFIDELITY.—Delivery of a mature or premature child having taken place, the woman (without having meanwhile seen her husband, and without having again submitted to coitus) may, in the course of one, two, or three months, be delivered of another child, which may be either mature or premature. Such cases are susceptible of explanation in three ways:

First. In twin pregnancies one child may be expelled and the other follow only after several weeks or months. (For cases, see Taylor's *Medical Jurisprudence*, pp. 486–489; Rams-

[1] For this, and the succeeding calendar months, allowing two inches for each month will give a rough approximate average of the child's length: 6th, 12; 7th, 14, etc.

[2] It will be observed that only the *external* appearances of the fœtus have been mentioned.

botham's *Obstetrics*, p. 468; Leishman's *Midwifery*, p. 193; Churchill's *Midwifery*, American edition, 1866, pp. 177, 178, etc.)

Second. The woman may have a double (bi-lobed) uterus, in each side of which is a fœtus, the two uterine cavities expelling their contents at different times. (For cases, see Playfair's *Midwifery*, pp. 58 and 161; Leishman's *Midwifery*, pp. 188, 189; Taylor's *Jurisprudence*, p. 488; Churchill's *Midwifery*, p. 178.)

Third. A pregnant woman submitting to coitus during the early months of gestation may have a second ovule impregnated (super-fœtation), perhaps, just prior to the subsequent death or departure of her husband. The two fœtuses may be born at different times. (For cases, see Taylor's *Jurisprudence*, p. 487; Leishman's *Midwifery*, pp. 186–188; Playfair's *Midwifery*, pp. 161, 162; Churchill's *Midwifery*, pp. 177, 178.) The occurrence of super-fœtation has been questioned, but its possibility, and its actual occurrence as a matter of fact, are now generally admitted.

When the two children are of different race or color—one white, the other black—("super-fecundation") the fidelity of the female may be justly questioned.

Finally, a woman may expel a child from the uterus in the usual way, and still remain pregnant, even for years afterward, owing to the retained fœtus of a coexisting extra-uterine pregnancy.

True and False Moles.—The diagnosis of bodies expelled from the genital canal, not due to impregnation, from those necessarily the result of coitus has been already sufficiently considered. (See "Hydatidiform Pregnancies," p. 188, and "Moles," p. 191.)

Diagnosis of Pregnancy.—(See pp. 106–131.)

Signs of Recent Abortion in the Living.—When the fœtus and its membranes, in a case of suspected abortion, are concealed, a medical witness may be required to give evidence as to existing signs of recent abortion in the female. Abortion during the first three months of pregnancy may, even so soon as twenty-four hours after delivery, leave *no proofs whatever* of its occurrence, in the living woman, that can be recognized by examination.

The ordinary signs—at best ambiguous—viz., dilatation of the os uteri, with some lochial (bloody) discharge therefrom, enlargement of the uterus, swelling and relaxation of the vulva and vaginal orifice, enlargement of the breasts, secretion of milk, presence of darkened areola around the nipple, etc.—may either be wanting, or, on the other hand, result from other causes.

Signs of Recent Abortion in the Dead.—Even the *post-mortem* signs of abortion during the first three months of pregnancy may so completely disappear in the course of a few days after delivery as to leave no positive evidence. Satisfactory proofs may, however, be obtained, if examination be made within forty-eight hours after expulsion of the ovum. Then we find usually some enlargement of the uterus, both of its cavity and walls, the latter being thicker and with larger bloodvessels than in a *normal* and unimpregnated state. Cavity of womb may (?) contain remnants of blood-clots, membranes, or placenta. The internal aspect of the uterus may exhibit, after and during latter part of third month, the placental site—a darkened and rough surface. Fallopian tubes and ovaries of deep color from physiological congestion of pregnancy. True corpus luteum in ovary. *Caution:* Even these evidences of early abortion—however soon after delivery—can scarcely be more than *presumptive*. Menstruation and uterine diseases require to be excluded (often very difficult) before certainty can be attained. The value of the corpus luteum is considered more at length below.

Signs of Recent Delivery during Later Months and at Full Term in the Living and in the Dead.—Symptoms in the *living* are: Women more or less weak and incapable of exertion. (Exceptions possible, especially with women in lower walks of life, and among negresses, Indians, and savages. For cases see Beck, vol. i. pp. 376, 377.) Slight pallor of face; eyes a little sunken and surrounded by darkened rings, and a whiteness of skin resembling convalescence from disease. The above symptoms often absent after three or four days. Abdomen soft: its skin relaxed, lying in folds, and traversed by whitish shining lines (*lineæ albicantes*), especially extending from the groin and pubes to navel. (Exceptions: these *may* be the result of dropsy, tumors, or a former

pregnancy.) Breasts, after the first day or two, full, tumid, and secreting milk. (Exceptions: some women secrete no milk after delivery.) Milk may be, or may be alleged to be, result of a previous pregnancy (before the one in question). Detection of colostrum corpuscles in milk shows delivery to be recent. Nipples present characteristic areola, especially "secondary areola," outside the disk. External genitals relaxed and tumefied from passage of child. Uterine globe felt in hypogastric region through walls of abdomen. Os uteri swollen and dilated sufficiently to admit two or more fingers. Lochial discharge: its color varying with interval since delivery; may be distinguished from menses and from leucorrhœa by its characteristic odor, sometimes described as resembling that of "fish oil." Absence, by laceration, of fourchette; but this is persistent after one labor. Os uteri fissured by radiating shallow lacerations or resulting cicatrices; the latter being, of course, permanent. All these signs *may* be wanting, or become so indistinct in a week or ten days after delivery as to be unreliable. In other cases they are available for two or even three weeks. Examine as early as possible in all cases.

Signs in the Dead.—These may be available two or three weeks after delivery. Not reliable later.

They are: Enlargement, thickening, and softer consistency of the uterus. During *first day or two*, womb will be found seven or eight inches long and four broad:[1] its walls one or one and a half inches thick; section presenting orifices of enlarged bloodvessels. After *one week*, following a full-term labor, womb between five and six inches long (about the "size of two fists"); after *two weeks*, five inches; at *a month* the organ may have contracted to its unimpregnated size. *Uterine cavity*, during first day or two, and perhaps later, contains bloody fluid, or coagula of blood, and pulpy remains of decidua. Placental site presents valvular, semilunar-shaped vascular openings, and looks dark, somewhat resembling gangrene in appearance. Fallopian tubes, round ligaments, and ovaries, purple from congestion. Spot where ovum escaped from the ovary especially vascular. Orbicular muscular fibres

[1] When, however, death has occurred from hemorrhage, and there is *no contraction* of the uterus, the organ will be found as a large flattened pouch, measuring ten or twelve inches in length.

around internal opening of Fallopian tubes distinctly visible for one or two weeks. All the above signs become less marked as interval since labor increases. *Ovary* presents true corpus luteum: value of evidence furnished by it variously estimated by authorities. Chief characteristics of "*true*" corpus luteum —the corpus luteum of *pregnancy*—are: its large *size*, long *duration*, its being (usually) *single*, and its having a distinct *cavity* (either empty or filled with coagulated blood), which is either substituted or followed by a stellate radiating, puckered *cicatrix*. Cavity as large as a pea, may remain three or four months after conception. Ovary is enlarged and *prominent* at the site of true corpus luteum. True corpus luteum varies greatly in size and duration in different women. During the first three months its average size is nearly one inch long by half an inch broad, and during remaining months of entire pregnancy it measures *about* half an inch long and a little less in width. Getting smaller toward the end of pregnancy, it still remains one-third of an inch in diameter for some days after parturition, and presents a sort of hardened tubercle even a month or more later. *False* corpus luteum (that following menstruation) grows only three weeks, when it measures about half an inch by three-quarters, and then retracts, becoming an insignificant cicatrix by the seventh or eighth week. It is not *prominent*, has no *cavity*, no *radiating cicatrix*, and is associated with *others*, like itself, perhaps in both ovaries.

Evidence of pregnancy derived from corpus luteum is *corroborative* of other signs only: taken by itself it cannot furnish *positive* proof either way, owing to liability to exceptional variations in its development. It certainly cannot prove *childbirth*, for, after impregnation, fœtus may have been absorbed and ovum may have degenerated into hydatidiform mole.

Unconscious Delivery.—It is easy to imagine criminal cases—*ex. gr.*, infanticide—in which a plea of unconscious delivery might be set up. Medical testimony would, in such instances, be required as to the possibility of its occurrence in general, and also as to the likelihood of its having taken place in any given case. Women have undoubtedly been delivered unconsciously during sleep and syncope; during the coma of apoplexy, puerperal eclampsia, asphyxia, typhus, and other malignant fevers; also while under the influence of narcotic

poisons and anæsthetics, as well as after death. Others have been delivered while at stool, mistaking their sensations for those of defecation.(?)

Delivery during *ordinary* sleep very improbable in primiparæ, or in women with small pelves; less so in those with over-large pelves. Examine circumstantial evidence and insist on full statement of facts from woman herself, before admitting unconscious delivery in any particular case. Its possibility, however, is undoubted. (For cases, see Taylor's *Medical Jurisprudence*, pp. 417, 418, 419; Beck's *Medical Jurisprudence*, pp. 371, 372, 373.)

Feigned Delivery.—Delivery has been feigned for the purpose of extorting charity, compelling marriage, producing an heir, or disinheriting others, etc. When the woman has (admittedly) *never been pregnant before*, her fraudulent pretensions may be detected (usually, and especially if a *recent* delivery be claimed), by finding breasts unenlarged and presenting no appearance of milk-secretion, or characteristic areola; no lineæ albicantes upon the abdomen; no enlargement or irregularity of the os uteri; no discharge from vagina; a firm, solid, well-contracted, small, and easily movable womb. Compare alleged date of delivery with appearance of child alleged to have been delivered, noting skin, vernix caseosa, umbilical cord, size, hair, etc., of the latter. (For cases, see Beck's *Medical Jurisprudence*, pp. 342–355.)

When a pretended delivery has been *preceded by others* (one or more), detection is more difficult. Signs of recent delivery may or may not be present. Examine for them. Inquire into any mystery or concealment respecting situation of female before alleged delivery, during alleged pregnancy; also as to her age, and fertility, or previous prolonged sterility; also as to age, decrepitude, or impotency of alleged father.

Criminal Abortion—Fœticide.—A medical witness may be required to state the *natural* causes of abortion in general, and also his opinion, in particular, as to whether alleged (or proved) existing natural causes did, could, or were likely to produce it, in a given case. Such evidence may be necessary to eliminate *natural* from *criminal* causes, as, for example, when a female, having aborted spontaneously, attempts to fix the crime on an innocent person, and in other cases. The

natural causes—certain fevers, acute inflammation, syphilis, violent mental emotion, etc.—have already been mentioned. (See "Abortion, Causes of," p. 170.) An opinion as to the efficacy of one or more of them in a given case must depend (1) upon their intensity, location (of inflammation), virulence, and malignity (of fever), etc., and (2) upon the nervous irritability or susceptibility—in fact, *predisposition* to abort—on the part of the patient, especially as to history of previous abortions, and the "abortion habit."

Medical evidence may be required also as to *accidental* causes in general, and their probable efficacy in given cases. Such causes are: blows, falls, jarring the body by railroad and street-car accidents, joggling over rough pavements in vehicles, horseback exercise, etc. After blows upon the abdomen, the uterus, as well as the child, may or may not present evidences of contusion, laceration, incision, etc. Examine for them. Bones of child have even been broken and reunited *in utero*. As to the efficacy of accidental causes, the influence of *predisposition* to abort is paramount. Women have been subjected to repeated and prolonged mechanical violence without aborting when *no predisposition* existed. Books teem with cases. (For remarkable ones, see Beck's *Jurisprudence*, pp. 490, 491.) On the other hand, women *with* predisposition abort after very slight causes. Predisposition indicated by great emotional excitability, nervous habit, sensitiveness, and anæmia, or by plethora, with (previous habitual) profuse menstruation, or by previous existence of other constitutional diseases acting as spontaneous causes of abortion, and by existence of the "abortion habit."

Medical Testimony as to Medicinal Abortives and Instrumental Methods.—Medical witnesses should neglect no opportunity of stating (what are actual facts, viz.) that all these methods are (1) *uncertain* in their operation upon the child; (2) always dangerous and often fatal to the mother; and (3) sometimes fatal to mother without affecting infant. Children have survived and lived after the mother's death where premature delivery had been induced by criminal means.

Emetics have been given in large doses, and induced violent vomiting without producing abortion. The spasmodic con-

traction of the abdominal walls and diaphragm accompanying emesis are more dangerous in proportion to greater size and development of uterus; hence during later months. Fifteen grains of tartar emetic have been taken without interrupting pregnancy (Beck, vol. i. p. 475).

Cathartics.—Purging carried too far, continued too long, and when accompanied with tenesmus, as after administration of decided *drastics*, may produce abortion, especially during later months. Cathartics may be given during early months, especially when no *predisposition* exists, without decided effect. Pregnant women attacked with disease may be purged freely without abortion. (Cases: Beck, vol. i. pp. 475, 476.)

Diuretics.—A drachm of powdered *cantharides* (in one case) and 100 drops of oil of juniper every morning for twenty days (in another), have been taken to produce abortion (Beck, vol. ii. pp. 477, 478), but in both instances living children were born at full term. Cantharides, however, has induced miscarriages in some cases (Beck, vol. i. p. 478). These and such other diuretics, as broom, nitre, fern, etc., exert no specific action on the uterus, and they, together with mineral and *irritant poisons*, such as arsenic, corrosive sublimate, sulphate of copper, etc., can only be considered abortives when they occasion shock or produce sufficient irritation or inflammation to affect the general system, often at the expense of the woman's life.

Juniperus Sabina is a popular abortive, of undoubted efficacy in some cases, from the consequent irritation or inflammation it induces. It probably has no direct action upon the uterus. It has produced death, and has been taken for criminal purposes in sufficient doses to produce severe gastritis without abortion following. Physicians administering it to women suspected of pregnancy, or without being previously satisfied that pregnancy does not exist, would be fairly open to suspicion of criminality.

Secale Cornutum.—On trials for criminal abortion a medical witness must be prepared for a close examination on the specific emmenagogue properties of this drug (Taylor). Despite differences of opinion on this subject, the latest con-

clusion, and which seems inevitable, is that this medicine has a specific action as a direct uterine excitant, even when the uterus is not already in active contraction. Formerly it was supposed to act only when uterine contractions had already begun. Large doses have, however, been taken to produce abortion without effect (see Beck, vol. i. p. 483). Its emmenagogue properties increase as pregnancy advances, and are probably more marked at periods corresponding with the former catamenia. (For numerous references and cases, etc., see Taylor's *Jurisprudence*, pp. 433, 434, 435, and Beck, vol. i. pp. 482, 483.)

Tanacetum Vulgare has acquired popularity as an abortive. It possesses no specific action upon the uterus. The oil in doses of one drachm, four drachms, and eleven drachms, was taken respectively in three cases, each of the women dying in a few hours, without abortion coming on (Taylor, pp. 436, 437).

Hedeoma Pulegioides and Polygala Seneka are reputed abortives, but of doubtful efficacy. The former is a decided emmenagogue. One case of abortion from its *odor*(?) is reported (Beck, vol. i. p. 481), but I find none due to seneka.

Mercury.—Crude quicksilver (even in quantities of a pound at once) and medicinal preparations of mercury, continued even until salivation, have been given without producing abortion. Ptyalism from mercury may, however, produce it in those *predisposed.*

Bloodletting.—Bleeding, leeching, and cupping were formerly considered abortives, but there is abundant evidence to the contrary.

Instrumental Methods.—The reader is already familiar with the methods of inducing labor for beneficent purposes, elsewhere considered. Devices somewhat akin to them are resorted to for criminal purposes. In such cases examine carefully (1) the kind and extent of injury (if any) inflicted upon the uterus (especially the os and cervix) and the child; (2) note by what sort of instrument such injury could have been inflicted; (3) whether it could have been done by the

woman herself, or implied the interference or assistance of some other person; and (4) whether it indicated anatomical knowledge, or a want of it, on the part of the operator. Instruments *may* be introduced into uterine cavity repeatedly during the first three months of pregnancy without disturbing amniotic sac or discharging liquor amnii, and gestation still continue. After rupture of amnion uterus begins to act in ten, twenty, forty, or sixty hours—sometimes not for a week. When contents of uterus are submitted for inspection, be certain whether or not they contain a fœtus, mole, or hydatidiform mass. Diagnose ovum in early cases by seeing villi of chorion under microscope, if no fœtus be present. If there be a fœtus, ascertain its probable age (see pp. 538, 539). As to period at which a child *in utero* becomes alive or "quickens," be ready to state that *it is a living being from the time of conception*—as much so at any time during the first month as during the last. The idea of life being imparted to it in any given period during pregnancy is an error long ago discarded.

Child-murder after Birth—Infanticide.—When a mother is suspected of killing her own child, medical testimony is necessary as to (1) whether she had been delivered of a child; (2) whether signs of delivery agree, as to time, etc., with appearances of child as to maturity, and length of survival after birth. (For signs of delivery, see pages 540–542; and for signs of maturity, page 539.)

Inspection of Child's Body.—Original notes (made on the spot) to be kept as to the following points:

1. Exact length and weight of body.
2. Peculiar marks or deformities about it.
3. Marks of violence and probable mode of their production.
4. Umbilical cord: whether cut, tied, or torn; its length, and appearance of its divided bloodvessels.
5. Vernix caseosa on groins, axillæ, etc., as indications of washing and other attentions.
6. Odor, color of, and separation of cuticle from skin, as evidence of putrefaction.

Duration of Survival after Birth.—Signs uncertain, but great precision not demanded of medical witness. Length

of survival for shorter time than twenty-four hours not to be determined by *any* sign. Drying, etc., of navel-string *may* occur in the *dead*. Usual appearances are during—

Second 24 *hours:* Skin less red than during first day. Meconium discharged, but large intestine still contains green-colored mucus. Amount of lung-inflation unreliable, though perfect inflation *indicates* many hours of life. Cord somewhat shrivelled, but still soft and bluish-colored from ligature to skin.

Third 24 *hours:* Skin tinged yellowish, cuticle somewhat cracked, preparatory to desquamation. Cord brown and drying.

Fourth 24 *hours:* Skin more yellow; desquamation of cuticle from chest and abdomen. Cord brownish-red, semi-transparent, flat and twisted. Skin in contact with it, red. Colon free from green mucus.

Fifth and Sixth 24 *hours:* Cuticle desquamating in various parts in small scales or fine powder. Cord separates fifth day, but may not do so till eighth or tenth. Ductus arteriosus contracted; foramen ovale partly closed.

Sixth to Twelfth day: Cuticle separating from limbs. If cord was small, umbilicus cicatrized by tenth day; may not be healed completely till three or four weeks—much depends on the mode in which it has been dressed. Body heavier. Ductus arteriosus entirely closed; exceptions quite possible.

Was the Child Born Alive?—This question involves several upon which medical testimony may be required, viz.: (1) Did child *live* (as indicated by pulse, etc.), but *without breathing?* Children may so live for a short period (during which violence may be used), but there are no satisfactory post-mortem medical data to enable a witness to express a positive opinion on this point. Absence of respiration does not prove child to have been born dead, for it may have been drowned (in a bath) or suffocated intentionally at the moment of birth. Marks of violence *may* afford *un*certain proof. Marks of putrefaction *in utero* prove death before birth; they are, chiefly, flaccidity of body, so that it easily flattens by its own weight; skin reddish-brown—not green; that covering hands and feet is white, with cuticle sometimes raised in blisters containing reddish serum. Bones movable and readily separated from soft parts. These appearances occur after child

has remained dead *in utero* eight or ten days; scarcely available sooner. (N. B.—The skin may become greenish when body is long exposed to air.) (2) Did child *breathe as well as live?* (3) If so, did it breathe perfectly, or *imperfectly?* Evidences of child having breathed are—

1*st. The Static Test.*—The absolute or *actual* weight of the lungs is increased after respiration, owing to greater quantity of blood they contain. Hence 1000 grains have been proposed for average weight of lungs *after* respiration, and 600 grains *before* respiration. Actual weight of child and of its organs varies so much in different individuals as to render this test totally *un*reliable. A second method of its application (Ploucquet's test) is to take the *relative* weight of the lungs as compared with that of the body, before and after respiration. Different observers have obtained the following *average* results:

	Before respiration.			After respiration.		
	Lungs.		Body.	Lungs.		Body.
Ploucquet . .	1	:	70	1	:	35
Schmitt . .	1	:	52	1	:	42
Chaussier . .	1	:	49	1	:	39
Devergie . .	1	:	60	1	:	45
Beck . . .	1	:	47	1	:	40

Hence this test is certainly not infallible, but may furnish *corroborative* proof.

2*d. The Hydrostatic Test* (specific gravity of lungs).—Its general principle is, that *before* respiration the lungs *sink* rapidly when placed in water, *after* respiration they *float* high in that fluid. They may, however, float from other causes, viz., from gases developed in them during putrefaction, from artificial inflation, and from emphysema. In these cases the contained air (or gas) can be forced out of the lungs by compression (to be applied as described below), so that they afterward sink; this cannot be done after *perfect* respiration. Artificial inflation does *not* increase weight of lungs. After *im*perfect respiration (as in feeble children, or those who take only a few gasps) the air *can* be expelled by compression, so that this is not to be distinguished from artificial inflation.

Exceptionally, the lungs may sink after respiration, from congestion, inflammation, and other diseases having increased

their weight. Incising the lung and squeezing out its extra blood, or cutting it up and compressing each piece, will generally cause the organ, or some pieces of it, to float, if the child have breathed.

Application of Hydrostatic Test.—Having opened chest, note *position* of lungs (*before* respiration they occupy a small space at upper and posterior parts of thorax); their *volume* (of course increased after breathing); their *shape* (before respiration, borders sharp or pointed; after it, rounded); their *color* (before breathing, brownish-red; after it, pale red or pink); their appearance as regards disease and putrefaction; and whether they *crepitate* on pressure (as they will *after* respiration).

Take out lungs, with heart attached, and place them in pure water having temperature of surrounding air. Note whether they float (high or low), or sink (slowly or rapidly). Separate them from the heart; weigh them accurately, and then place them in water again, and note sinking or floating as before. Subject each lung to pressure with the hand, and note sinking or floating again. Cut each lung in pieces and test floating again. Take out each piece, wrap it in a cloth, and compress with fingers as hard as possible, and test floating, etc., as before. The crucial test of *perfect respiration* is each piece floating after the most vigorous compression.

Value of Respiration as Evidence of Live Birth.—Respiration does not *prove* child to have been *born alive*, for it may have breathed (imperfectly at least), and even have been heard to cry in the vagina or uterus[1] before birth was complete, as in face cases, and retained head in breech presentations, etc. Exceptionally a child may live and even breathe (by bronchial respiration only) for hours and even days with partial, and twenty-four hours with actually *complete*, absence of air from the lungs. (Cases: see Taylor, pp. 335, 336, 337; Beck, vol. i. p. 517.) The lungs retain their fœtal condition of atelectasis. That they are not hepatized is proved by their susceptibility to artificial inflation. Physiological explanation of life under such circumstances still wanting. Probably *complete* absence of air is only apparent instead of real, owing

[1] It is said a child has been heard to cry *in utero* weeks before delivery (Taylor, pp. 350, 351; Beck, vol. i. pp. 537, 538). On this point one feels disposed to adopt the remark of La Fontaine and Velpeau: "Since learned and credible men have heard it, I will believe it; but I should not believe it if I heard it myself."

to our means of demonstration being imperfect. Here the hydrostatic test is inapplicable, but the fact does not lessen its value in proving signs of respiration that *do* exist in other cases.

Evidence of Life from Circulatory Organs.—The contracted or open condition of the foramen ovale, ductus arteriosus, and ductus venosus, furnishes no reliable evidence of live birth.

Evidence from Stomach.—The presence of farinaceous or other food in the stomach proves the child to have lived after delivery was complete, at least in the absence of any proof that food was placed in the stomach after death.

Natural Causes of Death in Newborn Children, and which, of course, have a direct bearing upon infanticide, are: Prematurity of birth; congenital disease, or malformation; protracted or difficult delivery; compression of umbilical cord; hemorrhage from the cord or umbilicus. (See pages 231, 272, 470.)

Violent Causes of Death in Newborn Children may be either *accidental* or *criminal*. Death, however, may occur without any *marks* of violence, as from cold, starvation, suffocation, and drowning. In so far as these latter are concerned, an obstetrician may be required to testify as to the newly delivered female having sufficient strength, knowledge, sanity, and presence of mind to take proper care of her child, and prevent those occurrences. In a primipara, when delivered alone, the lack of these conditions may exonerate her from intentional guilt, as when the infant has been proved to have died by resting on its face in a pool of blood, or some other discharge; or when it has been delivered into a vessel containing water, on which the woman was seated, while mistaking her symptoms for those of defecation, etc. The opinion of an obstetrician in these cases, however, must be very guarded, especially with reference to single women and those delivered of illegitimate children. The circumstances attending delivery should first be accurately known, or at least diligently inquired into. The same caution is necessary in death *with* marks of violence, as in fractures of the skull, alleged

to have occurred by the child falling during sudden delivery in the erect posture, or by innocent attempts at self-delivery, or attempts made by a midwife or other person. Marks of strangulation around the neck may be mistaken for those due to coiling of the navel-string round the same part, and *vice versa*. In death from coiling of the cord, there are no deep marks on, extravasation of blood beneath, nor ruffling or laceration of the skin, nor injury of the deeper-seated parts, as there usually are in homicidal strangulation. In strangled children the lungs have usually been inflated by respiration. In death from coiled cord they retain their fœtal condition. Marks on the neck may, possibly, be made by forcible efforts at self-delivery, or by *cap-strings*,[1] or by bending of the head forcibly toward the neck soon after death, or as an accident of labor. These must be distinguished from homicidal marks. Pale, shallow marks *may* be made by coiling of the navel-string, but they are not accompanied with extravasation, etc.

Fractures of the skull, from the use of instruments, during labor, even from force of uterus without instruments, and from falling of the child when the mother is suddenly delivered while erect, or while sitting in a water-closet, etc., can scarcely be distinguished from fractures or other injury due to criminal violence, except by circumstantial evidence, or by comparing size of child with pelvis in certain cases. The existence or non-existence of puerperal insanity (mania) is an important question in these cases.

Medical Evidence of Rape.—Medical evidence in rape is usually only corroborative of circumstantial proof, but may become leading testimony in cases of false accusation, or of brutal attempts upon infants and children.

Medical witnesses, before expressing an opinion as to whether rape have been perpetrated, should first understand the legal definition of rape, as to whether it mean contact, vulvar penetration, vaginal penetration, emission, rupture of the hymen, etc., one or more. The rule laid down in the United States is that "there must be *some* entrance proved of the male within the female organ." That is enough. No matter about emission, etc.

[1] *These*, however, have been used for *homicidal* strangulation.

Marks of Violence upon the Genitals are: ecchymosis, contusion, and laceration of the parts, with or without bleeding. Redness, tenderness, heat, and swelling from subsequent inflammation. *All* of these *may* disappear in two or three days after the act. In young children laceration of the perineum and of the vaginal wall, and penetration of the abdominal cavity, with fatal result, have occurred. Note that mechanical injury of the parts may result from other causes. In the absence of additional proof, a physician may only be able to state that the injuries are such as *might* be produced by rape. Inflammation, ulceration, and even gangrene of the vulva may also result from disease, as in the vaginitis and vulvitis of young children from worms, scrofula, uncleanly habits, erysipelas, malignant fevers, etc. In these, laceration and dilatation of the parts are absent, while the redness and purulent discharge are usually greater than follow violence.

Marks of Violence upon the Body.—In women previously accustomed to coitus these are important, as evidence of resistance on the part of the female. The genital signs may be wanting. Note exact form, position, and extent of any marks upon the body. If bruises exist, note presence or absence of color zones, indicating *date* of alleged assault.

Examination of Clothing.—Cut out stained spots from the clothing, whether dry or moist, and pale or colored, place in a watch-glass with just enough water thoroughly to moisten them for fifteen minutes, then squeeze out a few drops of their contents, and examine, under microscope for *human* blood-corpuscles and spermatozoids of seminal fluid. The evidence thus afforded, it is plain, may or may not be important, according to circumstances. The same may be said of microscopical examination of vaginal mucus for spermatozoa, whether in the living or the dead. Loose fibres of clothing, examined microscopically as to their color and material, may sometimes furnish evidence of importance as to personal contact of persons wearing such clothing.

Examination for Venereal Disease.—The existence of gonorrhœa or syphilis, either in the male or female, and its conveyance from one to the other, may afford either negative

or positive proof *pro re nata*. It should always be inquired into, and the time of its appearance after the alleged coitus, in the person said to have been infected by the other, duly noted.

Signs of Virginity.—The presence of an unruptured hymen affords presumptive, but not absolute, proof that the female is a virgin. The hymen may be congenitally absent, or ruptured from causes other than coitus; and impregnation without vaginal penetration during intercourse, may take place, the hymen remaining intact.

Pregnancy resulting from Rape was formerly thought to be impossible. The contrary is now universally admitted. Conception may or may not occur, as after ordinary intercourse.

Impotence.—A medical opinion may be required as to sexual capacity, in a male accused of rape, bastardy, etc. Congenital impotence, from defective development of organs, is very rare. It is indicated by the individual being (usually) fat, without hair on the face, and none or but little on the pubes; by his testes and penis remaining small; his voice weak, and of the falsetto quality. There is complete absence of sexual desire, and a general deficiency of virile attributes. The age of puberty varies. It is usually from 14 to 17 years; exceptionally not until 20 or 21. Rape, legally defined to mean "some penetration," has been committed by boys of 13, 12, or even 10 years (Cases in Taylor, p. 500). Procreation, however, is impossible until spermatozoids appear in the seminal fluid. They have been recognized microscopically at the age of 18, but may undoubtedly appear sooner. Boys have become fathers at 14, perhaps earlier (case of 14, in Taylor, p. 502). The beard, voice, development of the organs, and other marks of virility, should be our guides in any given case, rather than *age* alone.

A few cases are on record where puberty developed between the ages of two and three years. In one case (by Mr. Bruce Clark, *British Medical Journal*, February 6, 1886) hair appeared on the pubes at the age of eighteen months, and at four years of age this boy was as large as one at ten or twelve years, the penis being as large as that of a man, with morning

erection, but the testicles were small, and there were no evidences of sexual desire or seminal emissions. The perineum and pubes were well supplied with hair, but it was absent in the axillæ.

Impotence from Advanced Age.—Procreative power has been retained till the age of 60, 70, 80, and 90 years. Such individuals usually retain also an extraordinary degree of bodily and mental power. Sexual capacity may be lost much sooner. Age alone cannot define any limit.

Impotence from Loss of Organs, etc.—Loss of both testicles *does*, but loss of one does *not* render a man impotent. Examine for cicatrices, etc., upon scrotum. Even after removal of both, enough spermatic fluid may remain in the ducts during the first two or three weeks to confer procreative power. Persons in whom one of the testicles remains in the abdomen are not usually impotent. When both testicles remain undescended the individual may or may not be impotent —usually the former—according as the organs are or are not imperfect in their development. Medical opinion is to be based chiefly on signs of virility before stated, and on examination of secretion for spermatozoa.

As to impotence arising from injury of the generative organs, brain, spinal cord, etc., or from general diseases, a medical opinion must rest upon the circumstances attending each case.

APPENDIX.

Report on Uniformity in Obstetrical Nomenclature, adopted by the Section on Obstetrics of the Ninth International Medical Congress, held in Washington, D. C., September, 1887.

A. It is desirable to try to attain to uniformity in obstetrical nomenclature.

B. It is possible to arrive at uniformity of expression in regard to—

I. The Pelvic Diameters.
II. The Diameters of the Fœtal Head.
III. The Presentations of the Fœtus.
IV. The Positions of the Fœtus.
V. The Stages of Labor.
VI. The Factors of Labor.

C. The following definitions and designations are worthy of general adoption by obstetric teachers and authors:

I. Pelvic Brim Diameters.

1. Antero-Posterior:

1st. Between the middle of the sacral promontory and the point in the upper border of the symphysis pubis crossed by the *linea terminalis* = *Diameter Conjugata vera*, Cv.

2d. Between the middle of the promontory of the sacrum and the lower border of the symphysis pubis = *Diameter Conjugata diagonalis*, Cd.

2. Transverse:

Between the most distant points in the right and left ilio-pectineal lines = *Diameter Transversa*, T.

3. First Oblique:

Between right sacro-iliac synchondrosis and left pectineal eminence = *Diameter Diagonalis Dextra*, D. D.

4. Second Oblique:

Between left sacro-iliac synchondrosis and right pectineal eminence = *Diameter Diagonalis Læva*, D. L.

II. Fœtal Head Diameters.

1. From the tip of the occipital bone to the centre of the lower margin of the chin = *Diameter Occipito-Mentalis*, O. M.

2. From the occipital protuberance to the root of the nose = *Diameter Occipito-Frontalis*, O. F.

3. From the point of union of the neck and occiput to the centre of the anterior fontanelle = *Diameter sub-Occipito-Bregmatica*, s. O. B.

4. Between the two parietal protuberances = *Diameter Bi-Parietalis*, Bi-P.

5. Between the two lower extremities of the coronal suture = *Diameter Bi-Temporalis*, Bi-T.

III. Presentation or Lie of the Fœtus.

The *Presenting Part* is the part which is touched by the finger through the vagina, or which, during labor, is bounded by the girdle of resistance.

The *Occiput* is the portion of the head lying behind the posterior fontanelle.

The *Sinciput* is the portion of the head lying in front of the *bregma* (or anterior fontanelle).

The *Vertex* is the portion of the head lying between the fontanelles and extending laterally to the parietal protuberances.

Three groups of Presentations are to be recognized, two of which have the long axis of the fœtus in correspondence with the long axis of the uterus, while in the third the long axis of the fœtus is more oblique or transverse to the uterine axis.

1. Longitudinal.
 - (1) Cephalic, including—
 - Vertex and its modifications.
 - Face and its modifications.
 - (2) Pelvic, including—
 - Breech.
 - Feet.

2. Transverse or Trunk, including shoulder, or arm, and other rarer presentations.

IV. Positions of the Fœtus.

The positions of the fœtus are best named topographically, according as the denominator looks—*first*, to the left or the right side, and *second*, anteriorly or posteriorly. When initial letters are employed it is desirable to use the initials of the Latin words.

In the case of Vertex positions we have—

Left Occipito-Anterior = *Occipito-Læva-Anterior*, O. L. A.
Left Occipito-Posterior = *Occipito-Læva-Posterior*, O. L. P.
Right Occipito-Posterior = *Occipito-Dextra-Posterior*, O. D. P.
Right Occipito-Anterior = *Occipito-Dextra-Anterior*, O. D. A.

The Face positions are:

Right Mento-Posterior = *Mento-Dextra-Posterior*, M. D. P.
Right Mento-Anterior = *Mento-Dextra-Anterior*, M. D. A.
Left Mento-Anterior = *Mento-Læva-Anterior*, M. L. A.
Left Mento-Posterior = *Mento-Læva-Posterior*, M. L. P.

The Pelvic positions are:

Left Sacro-Anterior = *Sacro-Læva-Anterior*, S. L. A.
Left Sacro-Posterior = *Sacro-Læva-Posterior*, S. L. P.
Right Sacro-Posterior = *Sacro-Dextra-Posterior*, S. D. P.
Right Sacro-Anterior = *Sacro-Dextra-Anterior*, S. D. A.

The Shoulder *Presentations* are:

[1] Left Scapula-Anterior = *Scapula-Læva-Anterior*, Sc. L. A.
[1] Left Scapula-Posterior = *Scapula-Læva-Posterior*, Sc. L. P.
[1] Right Scapula-Posterior = *Scapula-Dextra-Posterior*, Sc. D. P.
[1] Right Scapula-Anterior = *Scapula-Dextra-Anterior*, Sc. D. A.

V. The Stages of Labor.

Labor is divisible into three stages.

1. First stage—from the commencement of regular pains until

[1] Left and Right refer, in this section, in all positions, to the left and right side of the mother, without regard to that side of the child.

complete dilatation of the os externum = *Stage of Effacement and Dilatation.*

2. Second stage—from dilatation of os externum until complete extrusion of child = *Stage of Expulsion.*

3. Third stage—from expulsion of child to complete extrusion of placenta and membranes = *Stage of the After-birth.*

VI. The Factors of Labor

are—

1. The Powers.
2. The Passages.
3. The Passengers.

D. Copies of the above resolutions shall be sent, in the name of the Section on Obstetrics of the Ninth International Medical Congress, to the various teachers and writers on obstetrics of the different nationalities represented at this Congress.

(Signed) De Laskie Miller, M.D.,
President of the Section.

A. F. A. King, M.D.
Wm. T. Lusk, M.D.
A. R. Simpson, M.D.

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